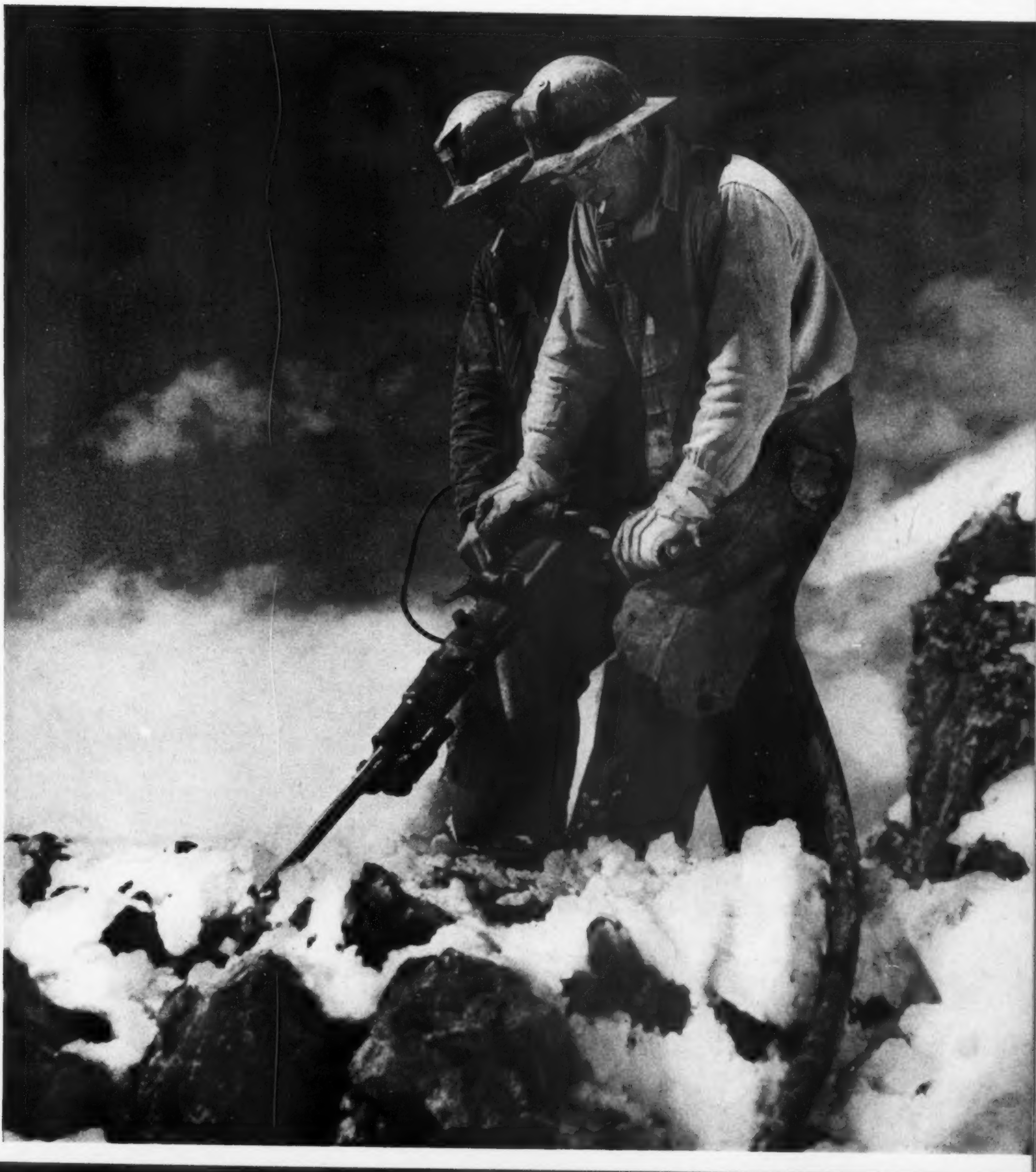
Mining CONGRESS JOURNAL

THE AMERICAN MINING CONGRESS

JUNE 1946



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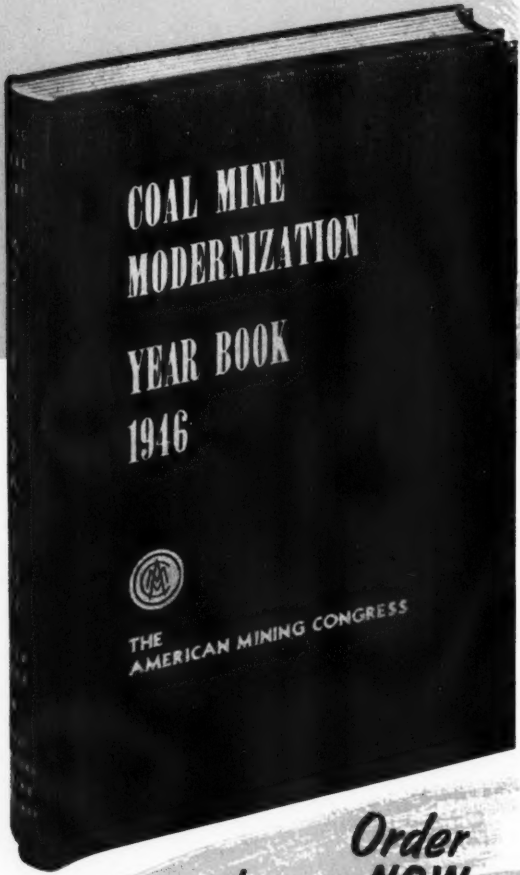

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FRONT COVER: A Jackhammer team at work at Shenandoah-Dives Mining Syndicate, Silverton, Colo.

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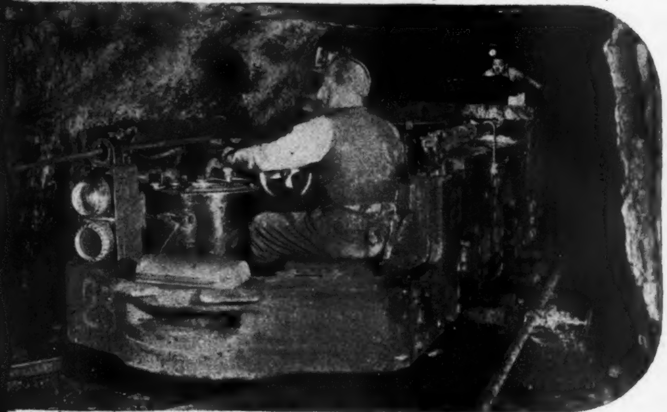

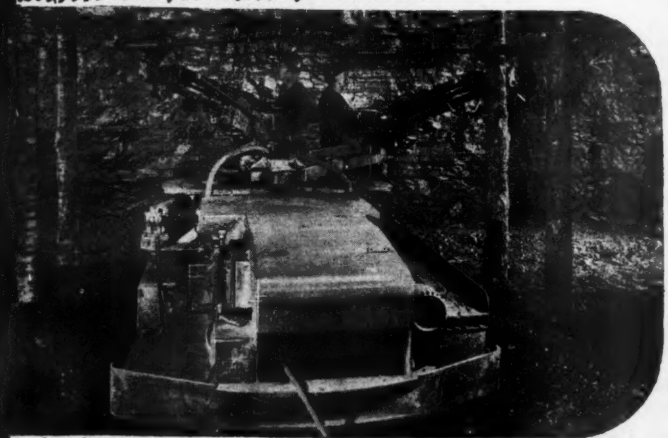

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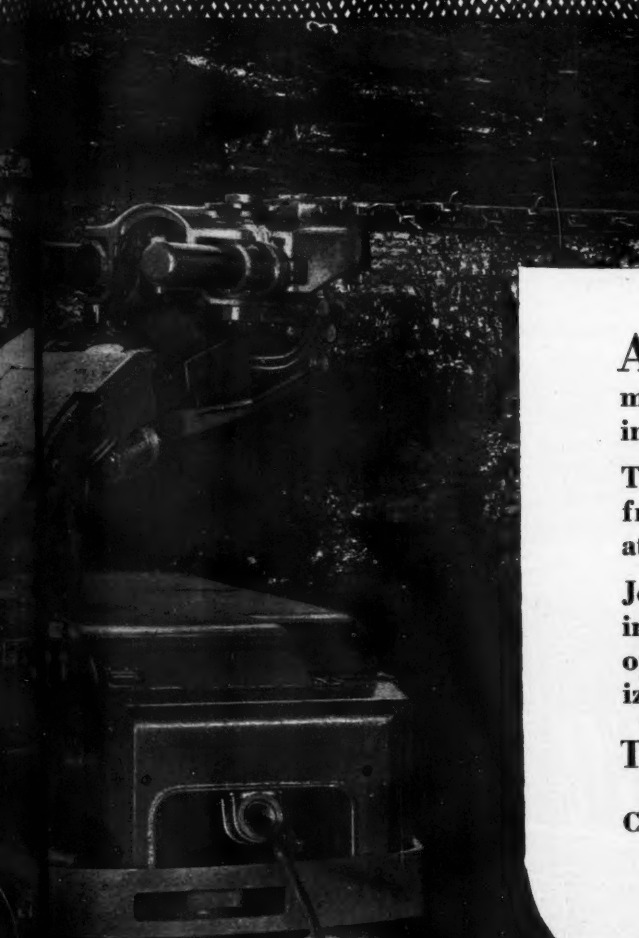

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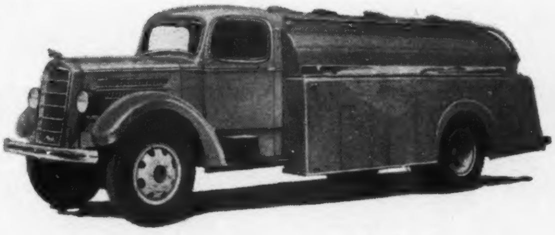
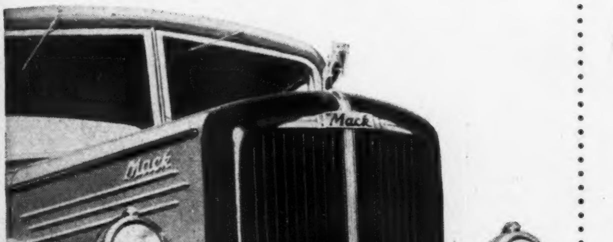
1906 The first Mack commercial gasoline vehicle was delivered in **1900**. It operated as a bus and later as a truck for 17 years. By 1906, the automotive industry's tenth birthday, Mack trucks had many advanced features, including the "high cab" (above), granddaddy of today's cab-over-engine design.

1916 Ten years later came the famous AC "bulldog" model which made the phrase "built like a Mack truck" a popular synonym for rugged strength. You can still see many of these trucks grinding along through city streets, steadfastly making money for their owners and looking quite at home in modern traffic.

1926 More powerful engines were being used, and by 1926 pneumatic tires were fast displacing solids and making possible greater road speeds. These progressive trends, plus certain exclusive refinements of Mack engineering, were embodied in the Mack AB.



1936 An important milestone in truck history was the introduction, in 1936, of the now widely-used Mack EH—a model which surpassed anything previously attained in truck performance.



1946 Today, with World War II experience crowning its 46 years of production, Mack again takes the lead in building the world's hardest-working trucks . . . *trucks which set industry standards for stamina, performance, economy and long life.*

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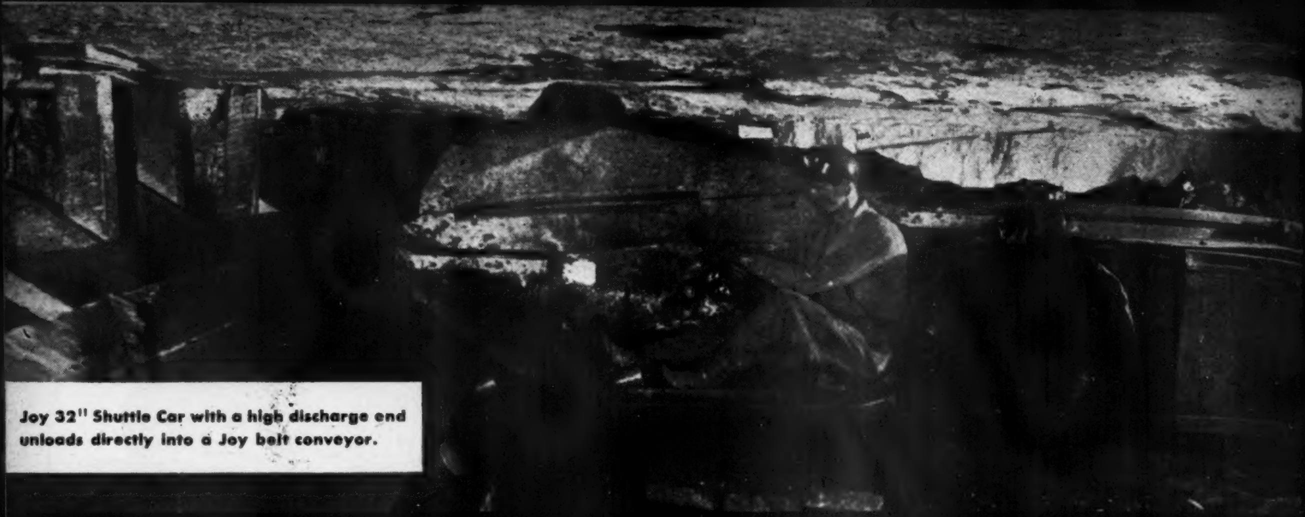

Joy 32" Shuttle Car with a high discharge end unloads directly into a Joy belt conveyor.

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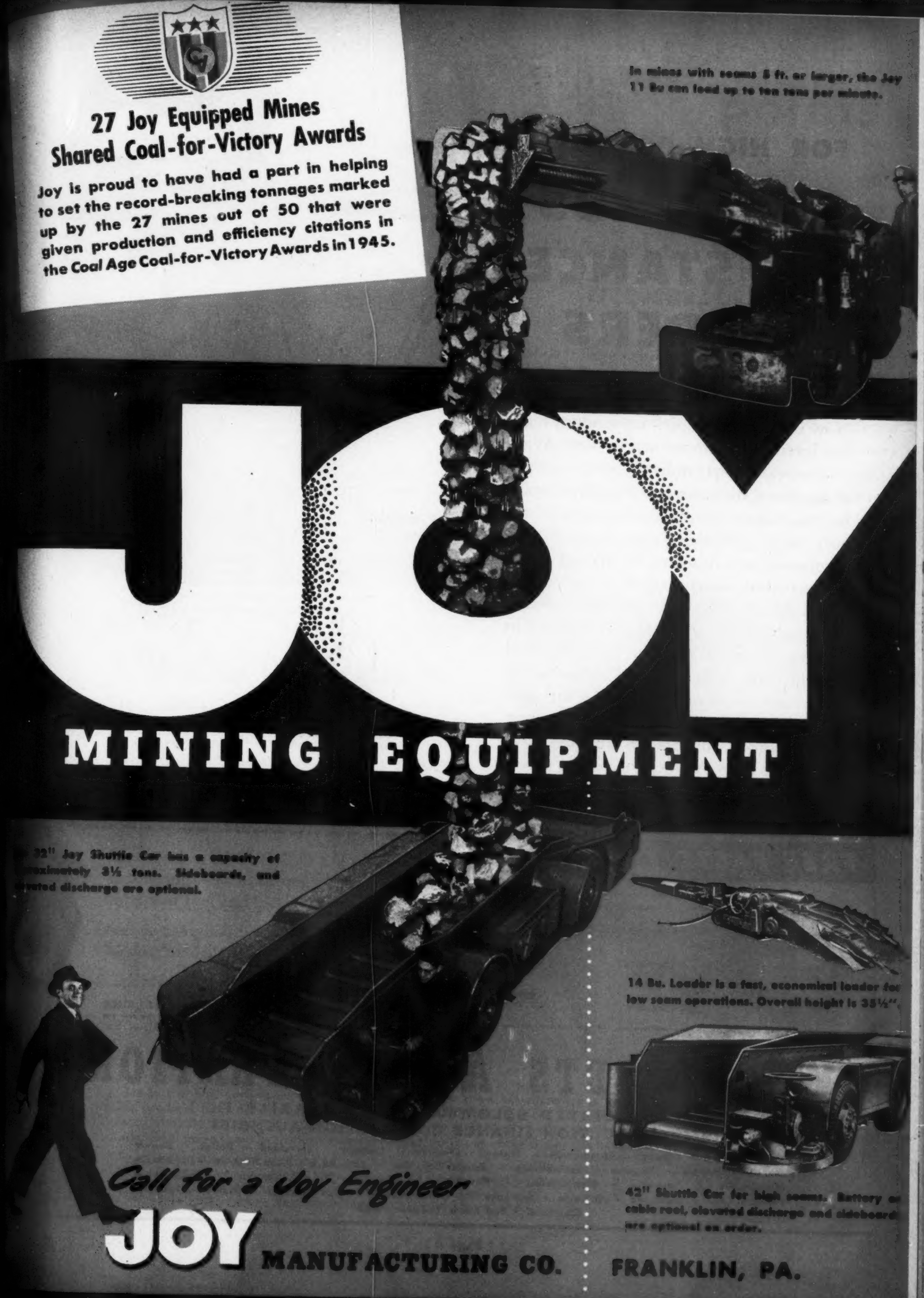
- ✔ Assured low maintenance expense

On-the-job lubrication is an easy matter with Joy equipment. Here a 14 Bu. gets maintenance attention.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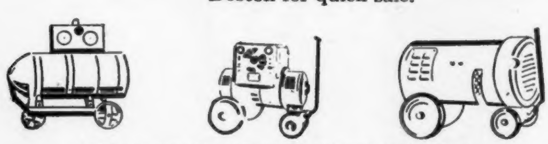

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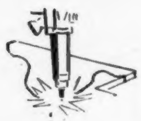

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RPM DELO Oil Reduces Filter Clogging Two Ways

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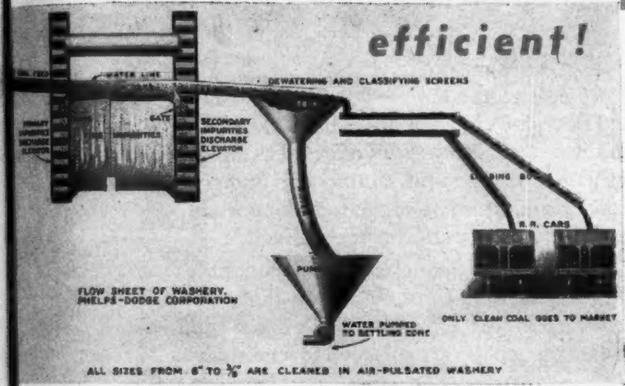
Island Creek . . . Holden, West Virginia

One of 3 complete Link-Belt preparation and blending plants, in Link-Belt air-pulsated washers at Mines Nos. 14, 20 and 22, Holden, Each has a capacity of 500 T.P.H. of run-of-mine coal, of which a ma of 475 T.P.H. of 5" x 1/4" can be washed. After 9 years of intensive s the plant at Mine No. 14 is being removed intact to a new mining op for this company at their Mine No. 24.

Weirton Coal Company . . . Isabella, Pennsylva

This Link-Belt preparation plant, which provides complete facilit washing, blending, drying and crushing, is economically producing low ash and sulphur content, with uniform results — meeting the e requirements of metallurgical work in a highly satisfactory n Capacity, 340 tons per hour.



Phelps-Dodge Corporation . . . Dawson, New M

A Link-Belt preparation plant was recently placed in operation at th Canon Branch Mine of this company. Its overall capacity is 300 t hour of R.O.M. A Link-Belt air-pulsated washer cleans 250 T. minus 6" coal, which is classified after cleaning, into a number of si

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LINK-BELT COMPANY

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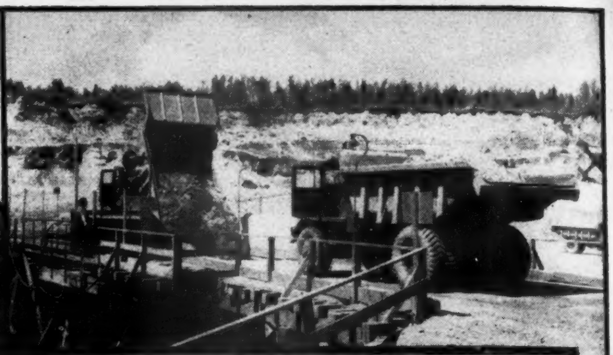

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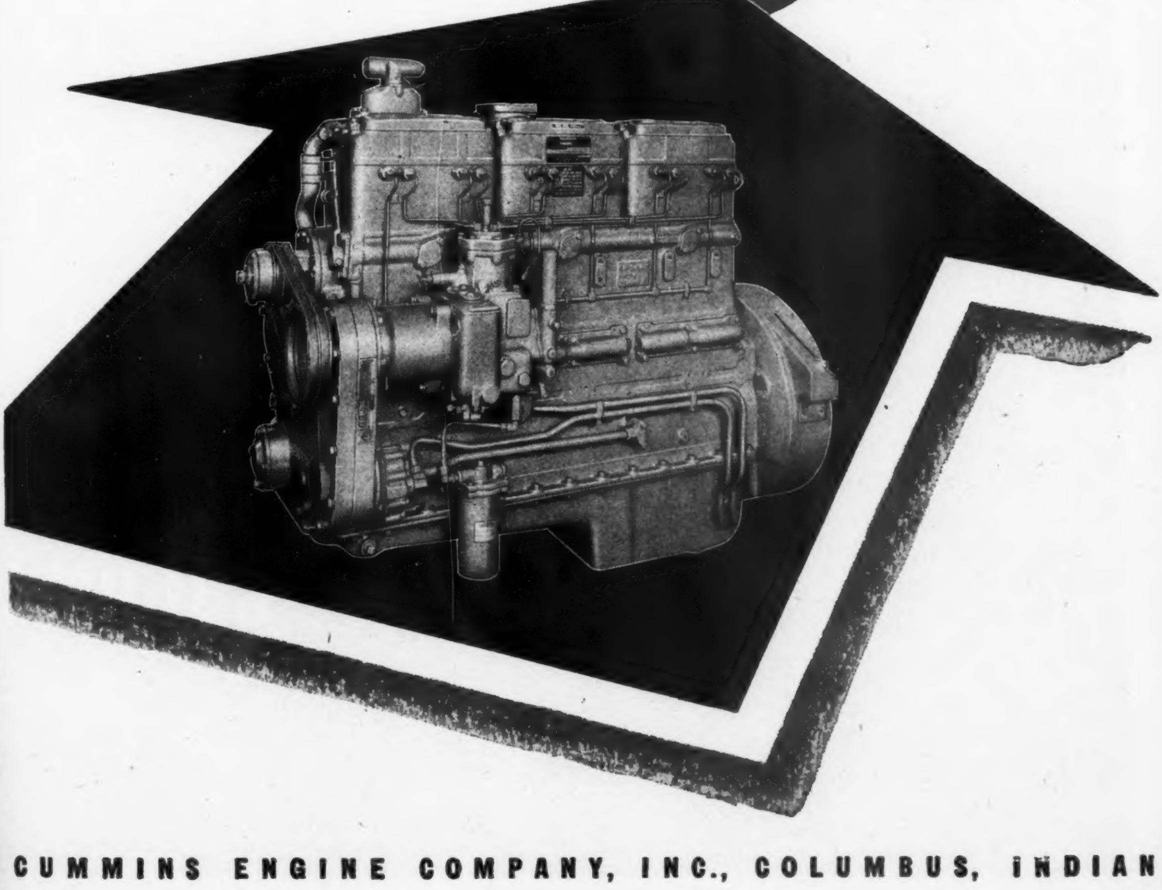
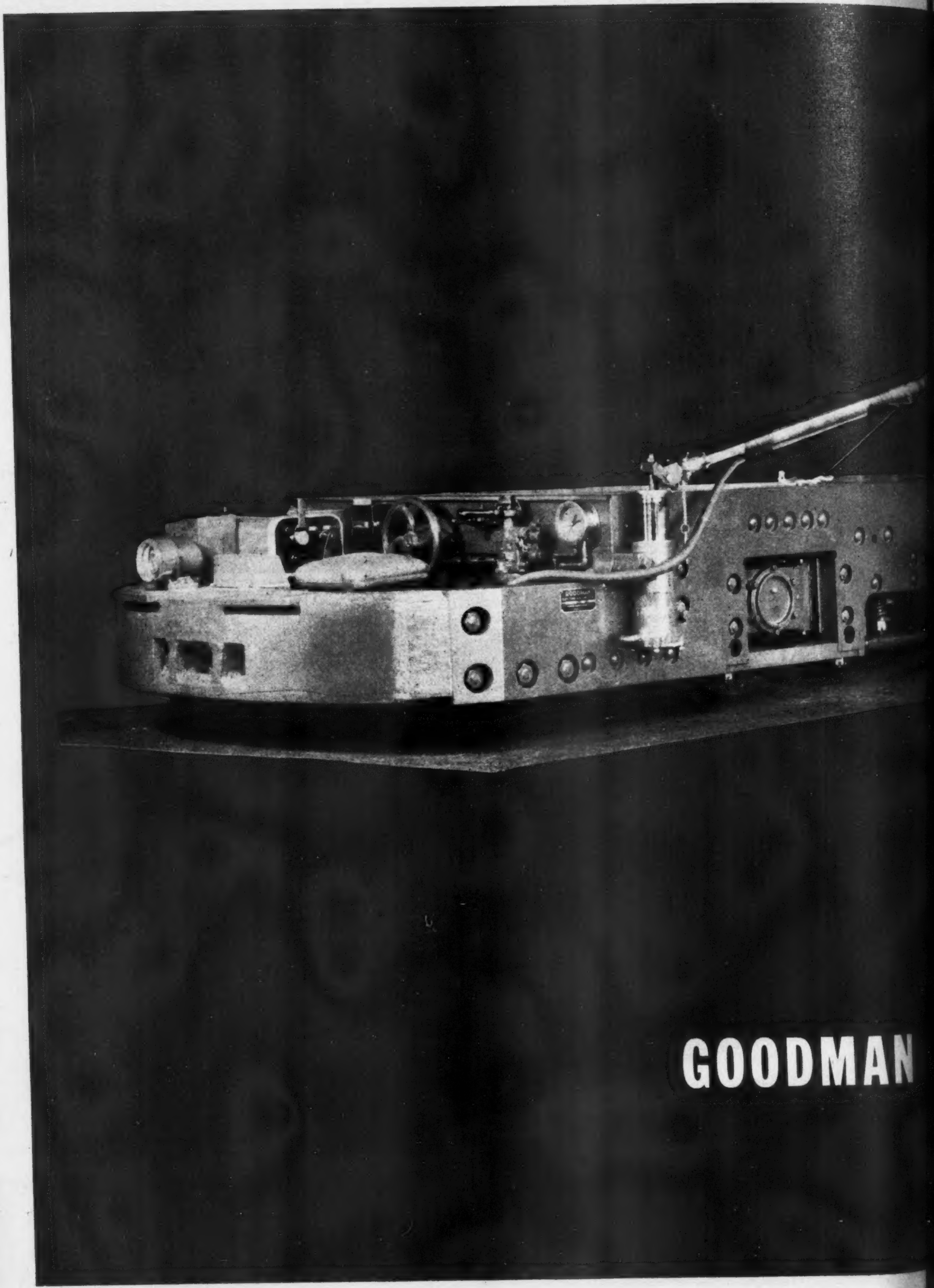
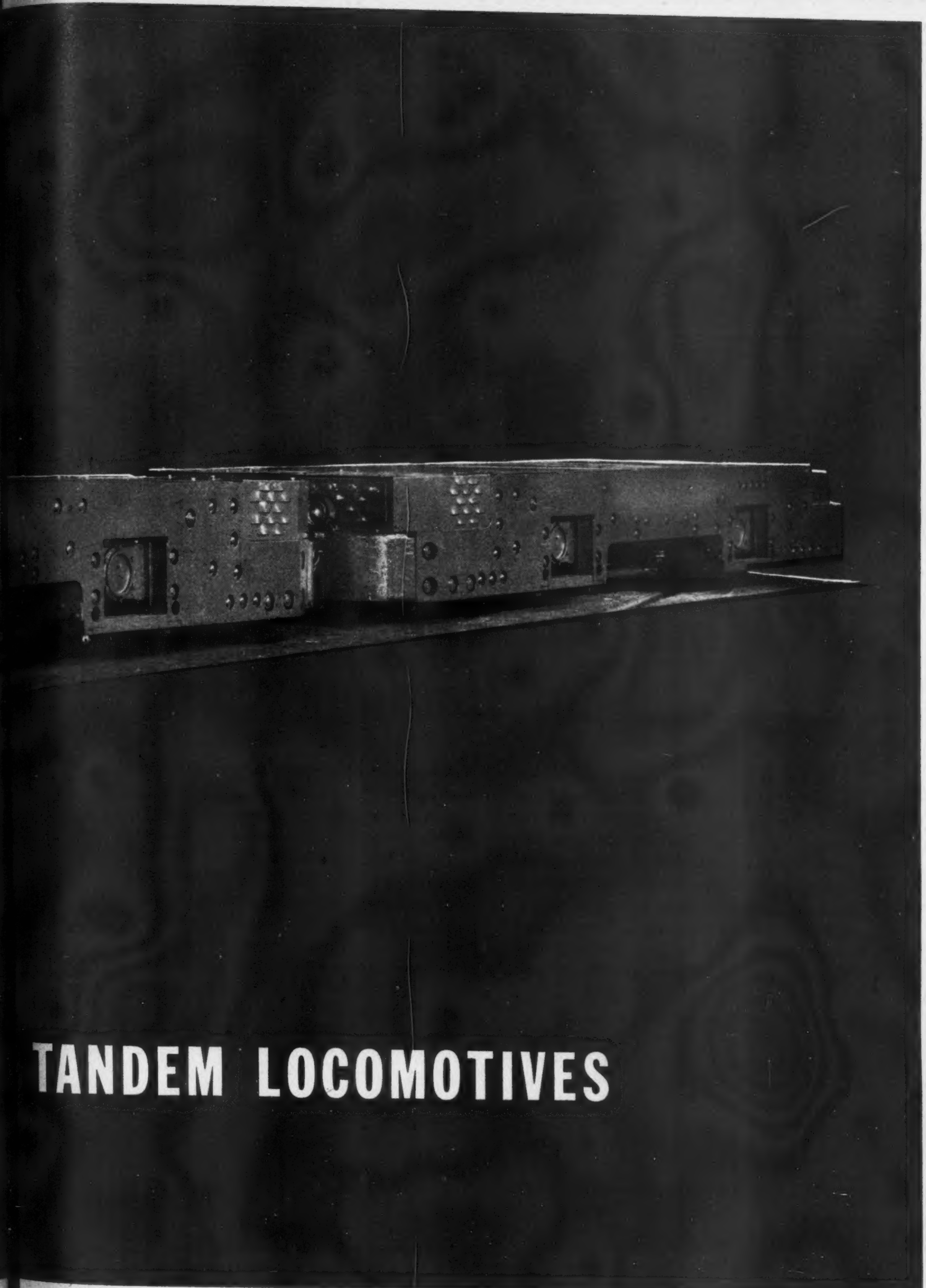


CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA


GOODMAN T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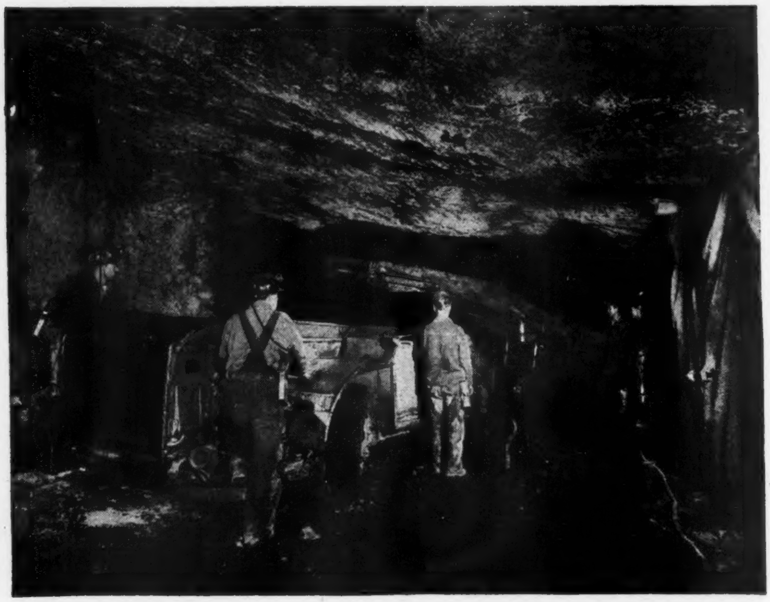

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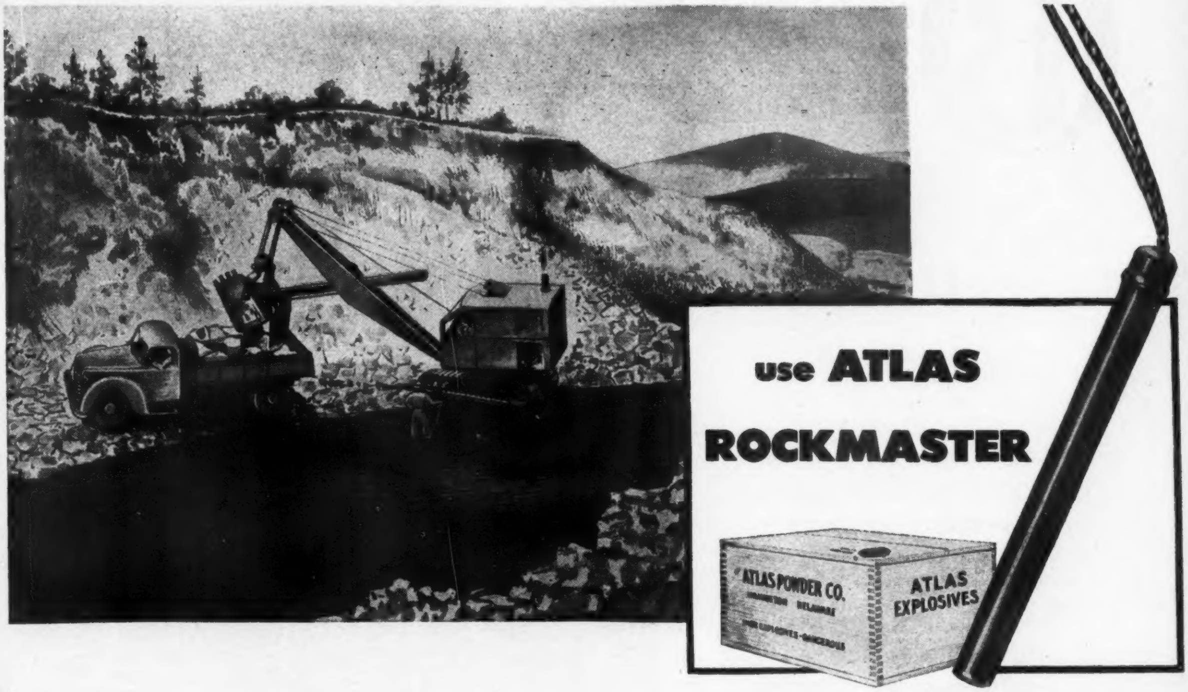

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Mining CONGRESS JOURNAL

Published for the Entire Mining Industry by The American Mining Congress

JULIAN W. FEISS, Editor

Volume 32 JUNE, 1946 Number 6

THE RESPONSIBILITY OF LABOR LEADERSHIP

RECENT weeks have seen the wheels of industry grind slowly towards a stop amidst a storm of bitter recrimination and endless strife. The President, a man by no means unsympathetic to labor, has been obliged to go before the people and propose legislation to terminate the constant internal warfare that may result in the economic collapse of our country. It must be obvious to labor leaders, as well as the public, that the present situation cannot continue indefinitely without resulting in complete economic, political, and social chaos.

The history of the labor movement in the United States has been marked, especially since World War I, by legislative enactments designed to enhance the status of the working man. The Railway Labor Act of 1926 created the United States Board of Mediation and required the use of collective bargaining in effecting agreements in the railway industry. In 1931 the Davis-Bacon Act fixed minimum wages in federal construction contracts. The Act of March 23, 1932, the Federal Anti-Injunction Act (usually known as the Norris-LaGuardia Act) prohibited the issuance of injunctions against certain acts in labor disputes and declared that no court in the United States could issue an injunction on the ground that individuals participating in a labor dispute were guilty of an unlawful act. Finally in Section 7a of the National Industrial Recovery Act of 1933 the right of employes to organize and bargain collectively, through representatives of their own choosing, was recognized as having universal application in industry, and in 1935, following the demise of NIRA the Government reaffirmed these principles in the National Labor Relations Act.

Throughout hostilities during the period of World War II these laws applied. Irrespective of the military situation and irrespective of the threat to the United States, the right to strike was recognized even though such action might result in withholding ammunition and matériel from men in our armed service engaged in a life or death struggle on the field of battle. We question whether such a right would have been recognized in any European country. Surely no labor leader today can contend that our laws and practices have been adverse to labor under such statutes as those mentioned above.

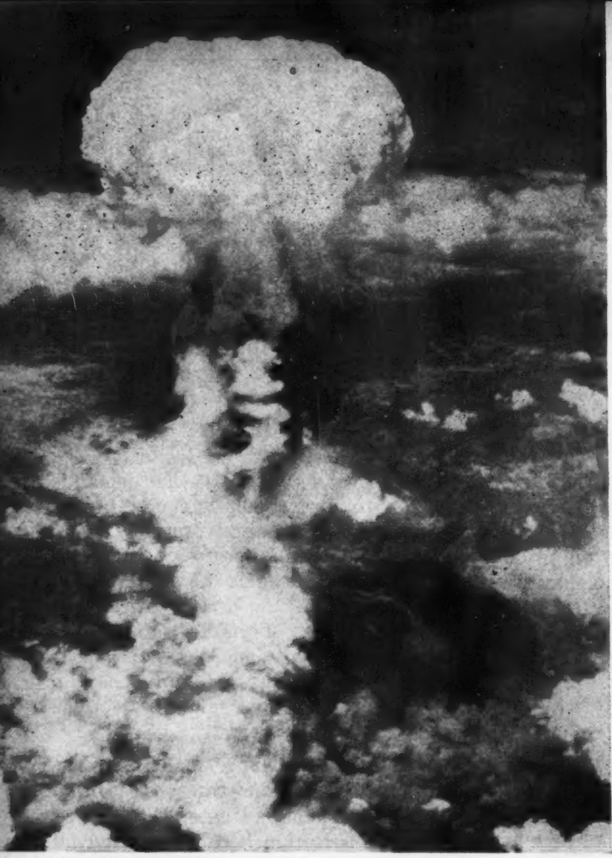
In many cases labor leaders recognized their responsibilities during the period of the actual conflict and even when these responsibilities were ignored, the pressure of public opinion was such that prolonged strife was avoided and demands submerged for the needs of national defense. Unfortunately there were some who through desire for power and personal aggrandizement ignored the welfare of the Nation to further their own ends. Finally the termination of hostilities has stimulated exorbitant demands on the part of labor leaders who see in the reconversion and reconstruction period the opportunity for increasing the power of their organizations.

Today the labor leader *demands*—he demands obedience from his followers, he demands higher wages from employers, he demands support from the public, he demands rights from the government, and recently certain labor leaders have in person *demanded* concessions from the President of the United States. The question of public welfare does not concern the labor leader in his demands; he is today above the law and as for the public, he can quote a former enemy to labor and say, "The public be damned."

It has become evident that labor leadership has in most cases passed the stage where reasoning can influence labor decisions. Unless the United States is to decline as a Nation because of internal industrial strife, the time has come to apply a check rein to the runaway horse. In a republic such as ours the method is through the law.

What is law? The *Encyclopedia Britannica* states "For the purpose of comparative jurisprudence, law may be defined as the authoritative regulation of social relations." Without law and law enforcement, government becomes anarchy and society vanishes in chaos. If we recognize the theory of the "greatest good to the greatest number," means must be found to prevent the endless suffering entailed as result of constant demands made on the public by irresponsible labor leadership.

It is evident that this country cannot stand the internal strain of perpetual labor strife. Nor is there any reason why the public should suffer the results of ruthless labor leadership. An empire of unprecedented power has been established within the body politic of the United States because of unbalanced legislation resulting in the establishment of an industrial labor despotism of even greater power than that of the "trusts" against which legislative action was taken a half-century ago. It is only human nature to take advantage of power and in this respect the labor leaders cannot be blamed for their actions. It is the function of Government to prevent such excesses on the part of any minority group at the expense of our national life, and the time has come to revise the laws which have permitted the growth of a system, which if it persists, will result in the ultimate destruction of the Nation.



Can this power be harnessed?

Atomic Energy

(Part I)

The Problems of Atomic Power are Brilliantly Presented by One of the Outstanding Authorities of the Manhattan Project and the Future Implications of This New Power Source are Carefully Examined

★

By ARTHUR L. HUGHES

Professor of Physics
Washington University
St. Louis, Mo.

★

I APPRECIATE the honor of being asked to address the American Mining Congress. You represent the industry which today supplies most of the power used in the civilized world. I am glad to have the opportunity of presenting the outlook for the use of atomic energy as an alternative source of power.

Atomic Power May be Anticipated in Future

It is now definitely possible that within 30 years we shall have some power plants using atomic energy. Perhaps 10 years from now, engineers charged with the problem of designing new power plants may seriously consider uranium as an alternative to coal or oil as the source of energy. I don't think, however, that they will then take the plunge and recommend uranium as preferable to coal or oil, but at least they will give serious consideration to the use of uranium as a source of power. Within 20 or 30 years, however, we may see uranium as a source of power in plants in regions where ordinary fuel is expensive. We may also see large ships driven by atomic power within 20 or 30 years.

Reports have been made that Britain is going in for atomic power in a big way. The coal supplies in Britain are running out and becoming more and more difficult to work. In order to maintain her former position as a manufacturing nation, it is easy to see how vitally important it is to her to have adequate and cheap sources of energy.

History of Past Research in Radioactivity

To explain the principles involved in the utilization of atomic energy, it is necessary to compress into a few minutes the main features of 50 years of scientific research in the field of radioactivity. Incidentally, this is perhaps one of the most spectacular illustrations of the usefulness of so-called "useless" science.

In 1905 Einstein announced the Principle of the Equivalence of Mass and Energy. Up to that time, all scientists believed in the Principle of the Conservation of Mass, that is, that no mass is ever created or destroyed. Likewise, the Principle of the Conservation of Energy stated that no energy is ever created or destroyed. There is always the same amount of it in the universe. What Einstein did was to show that if mass really disappeared, a definite amount of energy must appear in its place. He did *not* show how mass could be transformed into energy, or vice-versa. He gave the relationship between them. Thirty years elapsed before the first experimental confirmation of his prediction was obtained. What atomic power plants do is to convert mass into energy.

Now we turn for a few minutes to the story of radioactivity, which was first recognized 50 years ago.

Everybody knows that there is an enormous variety in the kinds of matter in existence—coal, air, dyes, chemicals, foods, flesh, bones, teeth, grass, wood, mica, granite. Every bit of

Presented before the Annual Coal Convention, American Mining Congress, April 30, 1946.

matter is composed of one, two, three or so simpler forms of matter called elements, which cannot be broken down into simpler forms. There were 92 of these known in 1939; now there are 96. The smallest bit of an element is called an atom. Physicists have now a good idea of what an atom looks like and how it is constructed.

Structure of the Atom

An atom consists of a positively charged nucleus surrounded by a cloud of negatively charged electrons. If you could enlarge the atom of gold to the size of this room, the nucleus would be represented by a housefly motionless at the center of the room, while the electrons would be represented by 79 mosquitoes buzzing around madly, each mosquito finding itself at some time or another in every part of the room. About 12 years ago discoveries were made which led to the present-day picture of a nucleus. A nucleus is made up of a certain number of protons and neutrons jammed together. The protons and neutrons have substantially the same mass, but the proton is positively charged, while the neutron is not charged at all. As an illustration, the nucleus of uranium atoms has 92 protons and 146 neutrons, and it is known as U 238, because the total number of particles in the nucleus is 92 plus 146, that is, 238. There is another variety of uranium called U 235. It has three fewer neutrons than the U 238; otherwise it is identical with U 238 in every respect. Atoms which differ only in the total number of particles, or—what is the same thing—atoms which differ in weight but in no other respect, are called isotopes of the same element. It is extraordinarily difficult to separate isotopes of the same element from one another.

Radioactivity and Transmutation of Elements

Up to about 1900 it was believed that all elements were eternal and everlasting. Once an atom of gold, always an atom of gold. However, the discovery radioactivity showed that this was not the case for radioactive elements. Radium was found to have a life expectancy of 1600 years, which means that if today you have an ounce of radium, then in 1600 years you will have only one-half ounce left, the other one-half ounce having changed into another element. Uranium has a life expectancy of 4,000,000,000 years, radon has a life expectancy of 3.5 days. Whenever one radioactive element transmutes into another, it gives out a tremendous amount of energy.

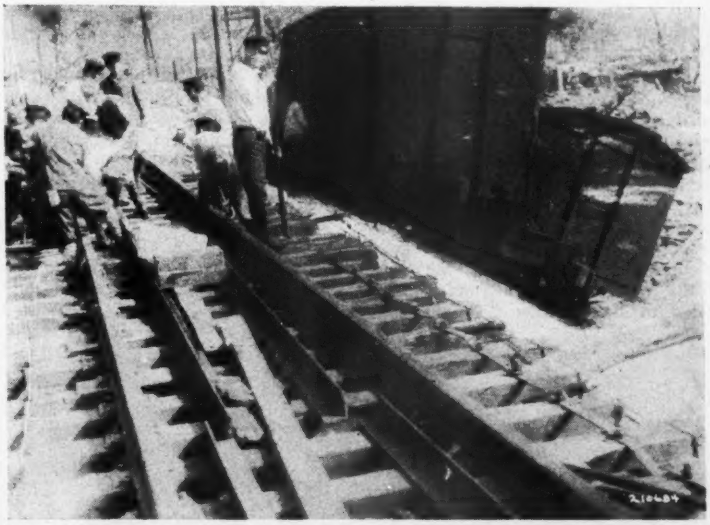
It was recognized that whenever an atom of radium changed into the daughter element, it gave out over 1,000,000 times as much energy as that given out when an atom of carbon combines with atoms of oxygen as in the combustion of coal. Whereas you can accelerate or slow down the combustion of coal as you like, it is impossible to change the rate at which energy is given out in radioactive transmutations. Up to 1939 it seemed as though controlling atomic energy for our use was entirely beyond our grasp. So here was the tantalizing situation: we knew that there was an enormous supply of energy in the nucleus of an atom, but we had no way of tapping it. It used to be said, and it is still true, that a few ounces of radium would drive the Lusitania across the Atlantic, but the catch is that it would take 2,000 years to do it. Lord Rutherford, the greatest experimental physicist of our time, and the acknowledged leader in radioactivity, saw no possibility of mankind ever finding a way of harnessing the energy in the nucleus. He died in 1937. Only two years later, in January, 1939, three Germans announced the discovery of a new phenomenon in radioactivity. This they called uranium fission. This discovery just cracked open the door to the bare possibility of releasing the energy known to exist in the atom.

Nuclear Fission

What is fission? When a neutron hits the nucleus of a uranium atom, it breaks up into two roughly equal parts flying away from each other with tremendous energy. These two products, in crashing through the adjacent matter, heat it up in much the same way that a bullet crashing into a block of wood heats it up. This, then, is the way in which atomic or nuclear energy is converted into heat. The amount of energy developed when the nucleus of a single uranium atom undergoes fission is 40,000,000 times that involved when one atom of carbon combines with oxygen as in the combustion of coal.

There is another extremely important fact that was noticed in the discovery of uranium fission, and it is this fact which makes the utilization of atomic energy possible. At the moment of fission 2, 3, or 4 new neutrons are ejected with high speed. So fission consists of the breaking up of the uranium nucleus into two nearly equal fragments, together with the ejection of 2, 3, or 4 new neutrons moving with high speed. If some of these new neutrons collide with other uranium nuclei, then further fissions take place, releasing more energy and more neutrons. These in turn, by colliding with other uranium nuclei, could cause still more fissions and still more neutrons. Thus a "chain reaction" would be started, and the process would perpetuate itself and release large amounts of energy in a short time.

The discovery of uranium fission in 1939 fascinated many physicists and they turned to investigating it with a will. For a few months the possibility of releasing atomic energy at one's pleasure was only a pipe dream. Then it dawned on a number of physicists that there might be more in it, that there was a bare chance, a one-in-a-million chance, that a military weapon could result from further study. Scientists immediately imposed a voluntary censorship on themselves, and ceased to publish scientific results. This was long before the army had the faintest idea that a new weapon far more potent than anything it had was in the making. It shows that scien-



This captured Japanese photograph shows box cars derailed over two miles from the explosion center at Hiroshima

tists are quite capable of keeping secrets when the keeping of secrets is important.

Government Action for Military Use

Representative scientists took the matter to the government, and very soon it got to President Roosevelt who was much intrigued by the revolutionary possibilities and gave the investigation his full support. Progress grew like a snowball. It was taken over by the OSRD and then later by the army engineers, under which it was organized as the Manhattan District. Over 50,000 people were employed on the project at one time or another, and about $2,000,000,000 is said to have been spent on it.

It is to be remembered that the single purpose of this project was to develop the atomic bomb in the shortest time possible. It was not interested at all in exploiting uranium fission to provide energy or to provide radium-like materials in huge quantities.

Intensive research showed that the rare isotope of uranium, that is, the isotope weighing 235, which forms only 0.7 per cent of natural uranium, no matter how pure, was suitable for use in the atomic bomb. The reason is that U 235 undergoes fission much more readily than U 238 and provides an adequate source of new neutrons to sustain a chain reaction. With pure U 235, enough new neutrons are produced to sustain the chain reaction; hence an explosive development of energy is possible. With ordinary pure uranium, that is, the uranium which contains 140 times as much U 238 as U 235, not enough new neutrons are available to keep the chain reaction going, because the U 238 consumes neutrons in processes which do not yield fission or new neutrons. Hence it was necessary to separate the isotope U 235 from the isotope U 238. Though this is a fantastically difficult problem, it was successfully accomplished.

Discovery of Plutonium

Because this problem is so difficult, a search was made for some other material which would undergo fission in a way similar to U 235, and which might be more easily separated from other substances. It was found that a new element, which did not exist five years ago and which is an element not found in nature but created by man, had just the right properties to be used as an alternative to U 235, and is more readily isolated than U 235. This element is called plutonium. Plutonium and U 235 are the only two substances which undergo fission in such a way that one can use them successfully in an atomic bomb.

How is plutonium produced? It occurs when neutrons bombard the plentiful isotope of uranium, the one known as U 238. The U 238 is first converted into U 239, which has a short life, changing into neptunium. This, which also has a short life, changes into plutonium. Most of the first bit of plutonium ever created was produced in the Washington University cyclotron by bombarding uranium with neutrons. After weeks and months of bombardment, the amount of plutonium obtained was less than would make the head of a pin. By an intensive study of this pinhead of plutonium, it was decided that plutonium had the properties which would make it useful in a bomb. On the basis of these studies it was decided to erect huge plants in Tennessee and Washington to make plutonium in large quantities. It was a daring gamble. No manufacturer in his senses would decide to spend hundreds of millions of dollars to build his final plant on the basis of laboratory experiments on less than a pinhead of material. In wartime you make gambles of this sort.

The Atomic Pile

How is plutonium made in quantity? It is produced very cleverly by means of a device called a pile or a reactor. A pile consists essentially of a large number of pieces of natural uranium, that is, with both isotopes 235 and 238 in those proportions occurring in nature. The space in between is filled with a material called a moderator, which can be heavy hydrogen, helium, beryllium, or carbon. The function of the moderator is to slow down the neutrons. Slow neutrons are ever so much more effective in producing fission in U 235 than fast neutrons. Let

Plants such as those at Oak Ridge, Tenn., may become important future power sources

us consider that somehow we have a source of neutrons inside a pile. Let us suppose that they enter a chunk of uranium. Most of the neutrons collide with the nuclei of U 238, for there are more of them, and convert them into plutonium. The others collide with the nuclei of U 235 and cause them to undergo fission, thereby releasing energy, and to give out 2, 3, 4, or 5 new neutrons. If the chunk of uranium is not too large, these new neutrons escape from this chunk into the moderator, which is carbon in the form of pure graphite. There they bounce around and are rapidly slowed down. Ultimately they find they way into a chunk of uranium. Some of them, as before, convert the U 238 into plutonium, others of them cause fission in the U 235, release energy, and shoot out 2, 3, 4, or 5 new neutrons. The process repeats itself indefinitely. If one used pure natural uranium without a moderator, the process would not repeat itself indefinitely. The U 238 takes too large a proportion of the neutrons, leaving too few to sustain the chain reaction. It was a most ingenious trick to make use of the fact that slow neutrons are far more effective in promoting fission in U 235 than fast neutrons, and to provide a slowing down mechanism by filling the space between the chunks of pure natural uranium with graphite.

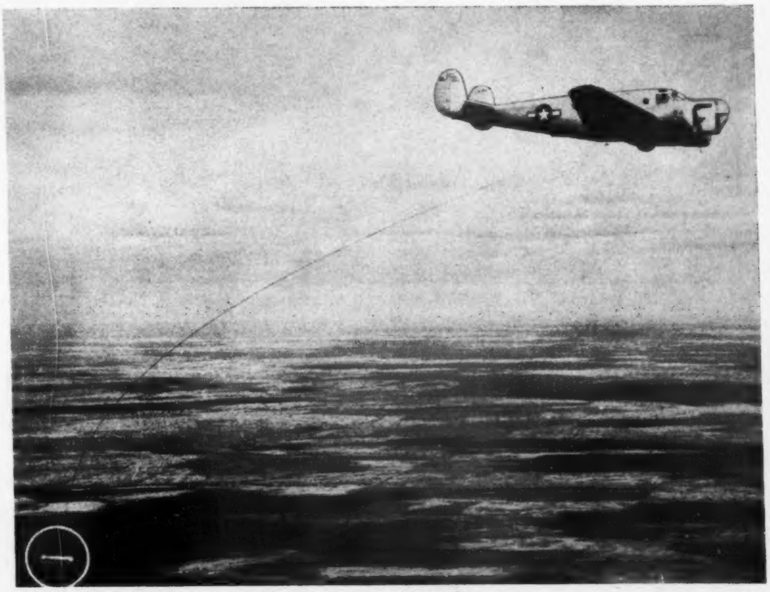
The next point is the matter of control. You can readily see that if conditions were too favorable, the process would go on too rapidly and the pile would destroy itself. Control is effected by pushing into the pile rods of material which absorb the neutrons powerfully. Cadmium and boron are two such materials. If the pile shows signs of getting out of hand, the cadmium rods are pushed in, thus absorbing more neutrons, leaving fewer to keep the chain reaction going. If the pile is not working fast enough, then the rods are pulled out a little way, leaving more neutrons available to speed up the reaction. The position of these rods can be varied by automatic control devices.

(To be concluded in the July issue.)

New Instrument Makes Geophysical Surveys from Air*

THROUGH the joint efforts of the Navy Department and the U. S. Geological Survey, development and successful testing of a magnetometer instrument that can be used in aeroplanes for rapid and accurate geophysical surveys of potential iron- and petroleum-producing areas was revealed recently by Secretary of the Interior J. A. Krug, as reported to him by W. E. Wrather, director of the U. S. Geological Survey.

Announcement of the existence and usefulness of the new exploration equipment has been withheld until the present time for reasons of military security, inasmuch as it is an adaptation of magnetic airborne detector instruments that were developed by the Naval Ordnance Laboratory and the Airborne Instrument Laboratory of the National Defense Research Council early in the war, for spotting deeply submerged enemy submarines operating in the open seas.



Plane towing magnetic detector

Recognizing the probable importance of the instrument as a geophysical exploration tool, the Geological Survey in 1943 entered into an arrangement with the Naval Ordnance Laboratory, under the auspices of the Naval Bureau of Ordnance and Bureau of Aeronautics, and with the Bell Telephone Laboratories, to perfect and make available the airborne magnetometer currently in use by the Geological Survey.

During the past two years the Geological Survey has employed the instrument, chiefly in cooperation with the Office of Naval Petroleum Reserves, in making test surveys of more than 40,000 square miles of territory, from the northern coast of Alaska to the Gulf of Mexico, at heights of from 150 to 14,000 feet above the ground. Accurate reference to ground position is secured in these surveys by electronic and photographic means.

A wide variety of geologic conditions of considerable scientific importance has been mapped with this equipment, although particular attention has so far been devoted to the locating of potential areas of petroleum and iron ore occurrence of commercial promise.

In all flight tests and under all condiitons the airborne magnetometer has proved itself to be unsurpassed as a means of making rapid magnetic reconnaissance surveys, according to Director Wrather.

In his report to Secretary Krug he points out that the most obvious advantages of this equipment are its speed of operation in the field and the fact that it can be used to map areas where distance or difficult terrain conditions make ground surveys of the same type impracticable or even impossible. It is equally valuable for use over either land or water.

A further advantage claimed for the instrument is that air surveys made with it can be completed more than 100 times as fast as would be possible on the ground, and with greater accuracy and detail of results.

The airborne instrument is not recognizably affected by steel rails, large tanks, pipelines, power lines or other artificial installations that have in the past limited the exploration utility of magnetometer instruments operated on the ground.

* This development of great interest to the mining industry will be discussed in further detail in our July issue.

Barytes Operations in Arkansas

Loading barytes in No. 1 pit

Strip Mining of Barytes at Magnet Cove Involves Problems Peculiar to the Climatic Conditions of the Arkansas Region

By O. J. BENSTON
Superintendent, Baroid Sales Division
National Lead Co.
Malvern, Ark.

MAGNET COVE is located in Northwestern Hot Spring County, in central Arkansas. The area gets its name from Magnet Crater, an igneous intrusive that surfaces with a crater like appearance. The ore formation lies in a series of synclinal folds that have been caused by a strong northwest thrust throughout the region. The synclines are noticeable topographically as novaculite ridges lying roughly North East to South West. The troughs of these synclines contain the Stanley Shale formation consisting of numerous clays, shales and sandstone strata and portions of these troughs are mineralized with barytes—this mineral consistently lying at or near the contact between the novaculate footwall and the shale hanging wall.

Occurrence of Deposit

The barytes mineralization is heavy in some localities and usually occurs in lenticular masses. In the main Magnet Cove area, the deposit varies from 20 to 70 ft. in thickness and averages somewhat over 40 ft. The main orebody lies in the upper and eastern end of Chamberlain Creek syncline which is cut off by the Magnet Crater at its west end. The deposit here is roughly one half mile long along the axis of the syncline, varying from nothing at the point of the axis, to three-eighths mile across the syncline at the western extreme of ore deposition, and from nothing at the east end to over 600 ft. depth at the west end. The ore is fairly continuous throughout and the formation is best described as spoon shaped. Originally it was thought that the Magnet Crater had a definite bearing on the formation of this orebody, but more recent investigations tend to show it as contemporary rather than causative.

Baroid Sales Division, National Lead Company is the largest operator in this area. The local plant and office is at the mine, about 7 miles due north of Malvern, Ark., by road a distance of 12 miles and roughly halfway between Malvern and Hot Spring.

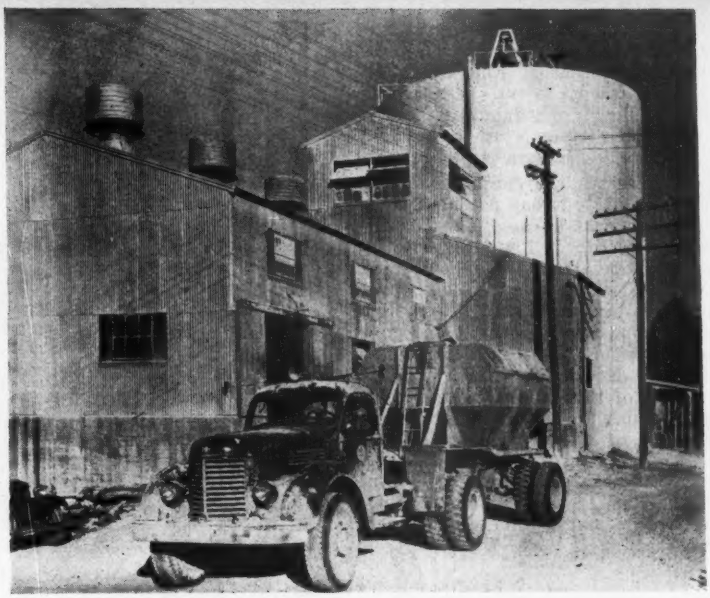
Low Grade Orebody Requires Fine Grinding

The orebody is relatively low grade, primarily because it is highly contaminated with residual material from the Stanley Shale host. These contaminants are primarily clay and shale, with occasional minor amounts of quartz and sandstone. The interlocking is at fairly fine sizes; a minus 325 mesh grind being necessary for

satisfactory liberation of the barytes. This fine grind fortunately serves another purpose in that this is the upper satisfactory particle size limit for oil well drilling mud, for which Arkansas barytes is largely used. All operations are from surface and open pit mining. The overburden is stripped by large scale dirt moving operations. Current stripping is in excess of 100,000 cu. yds. per month and is done by tractor-carryall and shovel-truck.

Mine production is by power shovel and trucks and operations started in late 1941 and were relatively small in scale. In early 1944, an extensive expansion program was started and the new plant was producing in May, 1945. Because of long rainy seasons and exceedingly wet mining conditions the ore is crushed wet. Since considerable clay and shale is contained in the crude ore as delivered to the mill, the wet crushing actually becomes a washing operation. Crushed and washed ore is stored in a fine ore bin from where it is conveyed to jig bins. Jigs are an essential part of the process in dividing the ore into two classes, high and low grade. The jigs do not make a finished tailing and crushing plant washings are concentrated and added to the jig tailings. Because of numerous factors such as character of the ore, character of the desired product, and the most equitable balance between production cost and metallurgical recovery, it has been demonstrated that a high grade feed and a low grade feed can be handled more efficiently separately than as an average crude ore feed. Both jig product and jig tailings are then ground, classified and floated separately. The finished flotation products are then recombined ahead of thickening, filtering and drying.

The dried product is hauled in 14 ton hopper trailers to the nearest railroad point at Butterfield, Ark., 5 miles from the plant and on the Rock Island system.



Storage silo and packing plant with bulk loading truck in foreground

Production Operations and Ore Reserves

The concentrating plant is operated on a 24-hour seven-day basis. Mining operations are on a one shift basis. Because of continual improvement and research, plant capacity is not yet fully established but the current rate is at about 30 tons of product per hour. Operations suffer somewhat

Access to operations is simplified by ample roadways

from a seasonal feature of a half-year rainy season followed by a half-year hot dry season. Annual rainfall averages about 50 in. with nearly 40 in. falling from January through June. The climate is otherwise mild and favorable for open pit operations.

Ore reserves are considerable and final blocking out has not been completed. Present information indicates an orebody life of 12 to 15 years at capacity operations. The deposit is favorably located geographically since the entire product is used for oil well drilling mud which moves to the gulf coast area of Texas and Louisiana. Minor ore deposits are known in other synclines of this immediate area, but the Chamberlain Creek syncline will take care of all demands for a long time. Additional baryte deposits are known in Arkansas but none have been exploited and developed to the same extent done as those in the Magnet Cove area.

Crushing, milling and concentrating is done in a modern plant

TITANIUM—A Neglected Metal that Promises to Become of Great Importance in Future Industry

THE metal titanium was first discovered in 1789 by the Rev. William Gregor, who was investigating a peculiar black sand from Cornwall, England. A few years later a German chemist, Klaproth by name, was investigating the mineral rutile and upon analysis discovered a new metal which he named titanium because of its strength in chemical combination; the reference obviously being to the Titans of Greek mythology who were supposed to be creatures of unnatural strength.

Titanium is a silver-white metallic substance with a fracture similar to that of steel. When cold it is hard and somewhat brittle but at a low red heat it is malleable and can be forged readily very much like iron. The atomic number of titanium is 22 and its atomic weight 48.1. The specific gravity is 4.5 and the melting point, according to Hunter, 1850° C. It is soluble in dilute sulphuric acid, aqua regia or hydrofluoric acid as well as hydrochloric acid when hot.

Titanium has been a cinderella amongst the metals. For the most part nobody has known what to do with it and when titanium has been present, particularly in the case of iron ores, it has generally been regarded as a nuisance. Titaniferous iron ores have been blamed for scaffolding of blast furnaces and the presence of titanium has been a detriment in normal furnace practice. It is true that titanium dioxide has come into wide use as a white pigment, but the metal has thus far been used only on a small scale. Although widespread in occurrence and prevalent in many regions of the United States and throughout the world, the ores of titanium have been neglected simply because nobody has known what to do with the substance once they had it. Wartime developments have changed this picture.

Titanium is estimated to be the ninth most plentiful element available on earth and this puts it ahead of copper, lead and zinc as regards abundance in the earth crust. The commonest ores of titanium are rutile (TiO_2) and ilmenite ($FeTiO_3$). The element is also found in titaniferous magnetite, titanite and perovokite but rutile and ilmenite are definitely the most important sources. Ilmenite is cheaper and more plentiful actually than rutile, and as a source of titanium is probably the most important of all. Ilmenite sands are found extensively throughout the United States, Canada, Sweden, Australia, Ceylon and India.

Probably the largest producer of titanium in the world today is the McIntyre property in the Adirondack Mountains at Tahawus, N. Y. In 1945 approximately 270,000 tons of ilmenite concentrate was produced from the property. There are also ilmenite properties in Virginia and investigations are being made of the coastal beaches of North Carolina.

Black beach sands containing ilmenite are common and beaches of relatively high value are reported from various parts of the world. From all evidence that is accumulated the world will probably not be short of titanium for a long time to come.

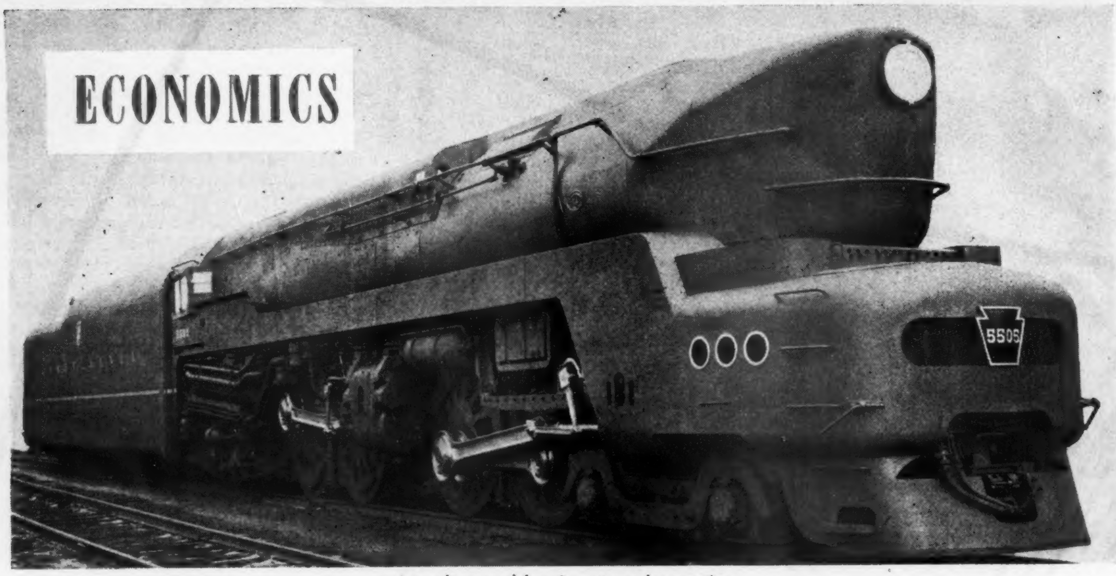
In the past the uses of titanium have been somewhat limited. The oxides of titanium have been noted for furnishing a particularly stable and glossy white pigment and have had considerable use in ceramics, plaster, linoleum, printing inks, textiles, soaps, and as one of the whitening substances used in false teeth. Alloys such as ferro-carbon-titanium are also used in steel metallurgy and there have been certain specialized developments of the metal in the machine tool industry where extreme hardness and high strength have been of primary consideration. Recently a series of experiments have been conducted by the United States Bureau of Mines on the production of titanium metal, and for the first time literature is available as to the possibilities and use of titanium for engineering and structural purposes. As yet this work is still in more or less the experimental stage.

Whether the uses of titanium will become as extensive as those of aluminum and magnesium is of course dependent upon future developments. One thing is certain, the sources are adequate and considering metallurgical advances of recent years, it is logical to expect that titanium will progress as have other metals as regards new usage. Electronics, the automotive industry, aviation, and the various mechanical trades can undoubtedly use titanium products as they begin to appear.

Digest OF PAPERS

The 1946 Coal Convention of the American Mining Congress at Cincinnati was a most successful meeting, with over thirteen hundred registered. Keynote of the Convention was "Looking to Coal's Future" and the digest of papers offered herewith indicates the comprehensive manner in which post-war trends were discussed.

This digest covers all the papers presented at the Convention sessions except those on reclamation and conservation of stripped-over lands. These will appear in full as a special section of our July issue. The complete convention proceedings, including all papers with illustrations and floor discussions, will be published in the 1946 Coal Mine Modernization Year Book.



A modern coal burning steam locomotive

Locomotive Fuel Economics

Improved Efficiency in Coal Burning Locomotives and New Developments in Coal Burning Turbines May Change Completely the Present Picture in Railway Motive Power

JOHN I. YELLOTT
Director of Research
Locomotive Development Committee
Bituminous Coal Research, Inc.

THUS FAR, no inventor has proposed a method of railroad propulsion which can compete with the force provided by the friction of loaded wheels on steel rails. The problem of railroad motive power has always been to find the most economical and suitable way of turning those wheels.

Coal has been the primary fuel for locomotives, although some of the western roads have used heavy oil for their long hauls across coalless territory. The position of oil as a railroad fuel has been tremendously strengthened by the introduction of the Diesel-electric combination, which proved its value first in switching and later in road service for both passenger and freight application. So spectacular has been the rise of the Diesel-electric locomotive that, if present trends were to continue, the coal-burning locomotive might, like the passenger pigeon, become extinct in one generation.

However, during the past five years, the reciprocating steam locomotive has been developed to such a high point that it can now compete in operating economy with the Diesel-electric. Using low cost bituminous coal to generate steam at 300 psi and 800 F., the new coal-burners can equal the fuel cost of the Diesel which must use high-grade oil, three to four times more costly than coal per heat unit. An entirely new prime mover, the gas turbine has now entered the locomotive field, and it appears to possess in large measure the advantages offered by both the Diesel and the steam locomotive.

To review first the subject of fuel reserves and present utilization, it must be realized that nature has generously endowed the United States with large supplies of fuel in gaseous, liquid, and solid forms. The exact extent of these reserves, both quantitatively and geographically, is not determinable, but both natural gas and petroleum may well approach exhaustion within the next generation. The one inexhaustible fuel resource in the United States as in the rest of the world is bituminous coal. Known deposits will suffice for the next 100 generations, even when the demands now being served by gas and oil are again met from coal through various synthetic processes.

Coal and the Railroads

The importance of coal to the railroads is well summarized by the fact that locomotives use one out of every five tons of coal mined while about one barrel of oil out of every seven is consumed by a locomotive. In 1943, one-quarter of all the freight carried by American railroads was bituminous coal (774 million tons), and the $900 million of revenue from this service represented more than 12 per cent of their gross income. The railroads paid back to the coal industry about $413 million for the 124 million tons of coal which they used. Further statistical detail may be summarized briefly. Steam still hauls 94 per cent of the freight and 86 per cent of the passengers; both types of traffic travel more miles per day than they did ten years ago, and substantial improvement has been made in freight locomotive performance, while passenger train fuel consumption per car mile has remained at about the same point for 16 years. The job done by the railroads during the war was spectacular, and it was more remarkable in that very little new equipment was available to meet unprecedented demands.

Most of the steam locomotives now in service are of relatively ancient vintage. About half of them are from

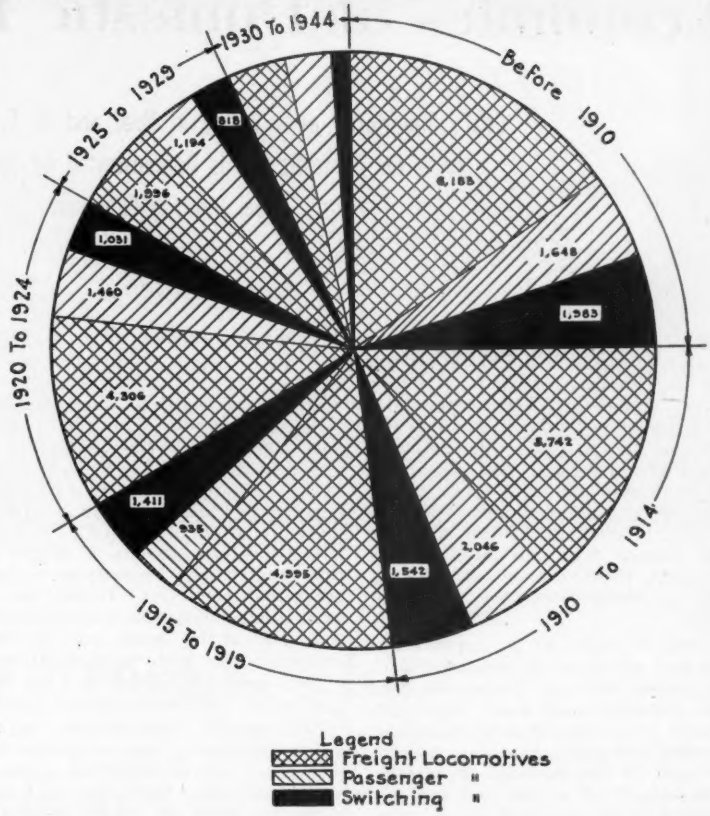
30 to 40 years old, and another third are between 20 and 30 years of age. Only one steam locomotive out of six now in service is less than 15 years old. Thus the great bulk of the nation's transportation load is being hauled by equipment which, according to the standards of most industries, is in need of replacement.

In purchasing new motive power, the railroads are leaning heavily upon Diesel-electric type for both switching and road service. Virtually no steam switchers have been ordered recently, while multi-unit Diesel combinations far out-number their coal-burning competitors for road use in both freight and passenger service.

In considering the economics of locomotive selection, particular care must be given to first cost and fuel cost. Advocates of the Diesel-electric have readily admitted that their first cost was high, but they have maintained that their excellent availability and low fuel consumption more than offset this advantage. With the introduction of really modern steam locomotives, such as the Pennsylvania T-1 type, the Diesel no longer possesses such a wide margin in fuel cost.

The debate on the subject of steam vs. Diesel cannot be resolved here, although it should be pointed out that the average aged steamer is at a serious disadvantage when its operating costs are compared with those of the Diesel. The modern coal-burner as represented by the T-1, on the other hand, presents quite a different picture, because its first cost is so much lower than that of the Diesel that the question of fixed charges is very pertinent. Maintenance costs on Diesels are debatable items, while those for steamers are fairly well established. It seems reasonable to assume that the T-1 type of large road locomotive will be cheaper to own, because of its relatively low fixed charge, than the more expensive and more efficient Diesel. Availability is likely to decide this particular question. Only in starting tractive effort does the Diesel have a marked advantage.

In their effort to develop a coal-burning locomotive which can unquestionably compete with the Diesel and overcome the drawbacks imposed by the steam boiler, the Locomotive Development Committee has undertaken the investigation of the coal-burning gas turbine for locomotive service. The gas turbine is the newest entrant in the prime mover competition, but its rise to prominence in many fields has been as spectacular as that of the Diesel-electric on the rails. The open cycle gas turbine is the simplest of all prime movers, since it consists essentially only of a compressor, a combustor where the fuel is burned in the compressed air, and a turbine in which the hot air expands, doing enough work to drive the compressor and the generator as well.

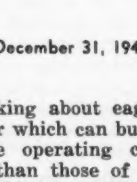


Steam locomotives in service of Class I railroads, December 31, 1943

For the first time, the gas turbine provides an opportunity to burn cheap fuels at high efficiency in a simple, water-less plant. Its reliability has been demonstrated by years of continuous operation in oil-refinery applications; its high efficiency has been attested by published data for both land- and marine-type installations, and its suitability for locomotive service is proven by the fact that the first such unit, built by Brown-Boveri of Switzerland in 1939, is still in regular service.

In summarizing the present status of the coal-burning gas turbine, it may be stated that feasible solutions to each of the major problems are now under active study. The Locomotive Development Committee expects that, within several months, an order will have been placed with one of the leading gas turbine manufacturers to produce the prime mover for a large single cab locomotive. It will undoubtedly be cheaper to put as much power as possible into this single unit, and a rail horsepower of 3,500 to 4,000 may readily be expected.

Most of the railroads of the country are looking about eagerly for a prime mover which can burn coal and yet produce operating costs which are better than those of the Diesel-electric combination. The most recent development in the art of steam locomotive construction has produced a locomotive of outstanding performance which can, with the present relative prices of oil and coal, provide rail horsepower hours more cheaply than the Diesel. When the problems of burning coal at high rates are solved, the gas turbine should prove to be the least expensive prime mover now available, because its fuel cost will be far lower than any which has hitherto been reached. Its first cost is still a matter of considerable uncertainty, but, because of its much ligher weight, it should cost less than the Diesel-electric.



Economics of Domestic Heating

Coal's Superiority as a Source of Heat and Its Economy Over Other Fuels for Domestic Use is Demonstrated by Improvements in Coal Burning Equipment

★

B. R. GEBHART

Vice President
Chicago, Wilmington & Franklin Coal Co.

★

PROBABLY more so now than ever before, coal's future in the market for domestic heating depends upon its ability, through excellence of product, efficiency of distribution, and convenience of use, to satisfy highly cultivated human desires. Thus there are three natural sub-heads under which this subject can logically be expanded, namely, product, distribution, and use. For reasons that will later become apparent, these divisions of the subject are being considered in reverse order.

First, however, let us examine the size and nature of the domestic heating market for coal. During the coal year recently closed, some 120,000,000 tons of bituminous coal were shipped to retail coal merchants; more than 20 per cent of the national production. Substantially all of this coal was distributed by the retailers in less than carload lots to consumers who used most of it for heating purposes. It is no secret that the coal in question accounted for much more than 20 per cent of the annual gross income of those who produced it.

The 1940 census reported 34,000,000 dwelling units in the United States with heating plants, of which 14,000,000 were equipped with central heating plants and 20,000,000 with stoves or cabinet heaters. Of those with central heating plants, 11,000,000 used coal or coke, probably accounting for 75,000,000 tons of such fuel consumed. Of those heated with stoves or cabinet heaters, some 7,600,000 used coal or coke, probably accounting for 20,000,000 tons of solid fuel consumed. Thus the total of coal and coke used in the heating of homes was approximately 95,000,000 tons.

Eighty per cent of the households with central heating plants used coal or coke, as did nearly 40 per cent of those with stoves. In both categories nearly one-fifth used oil or gas in 1940, the balance wood or other fuels. The high proportion of wood burners, being more than one-third of the dwelling units using stoves, represents a large potential market for coal, and many of these did, in fact, use coal during the war. Better prepared coal or better stoves, or both, may succeed in holding for coal a good share of this market.

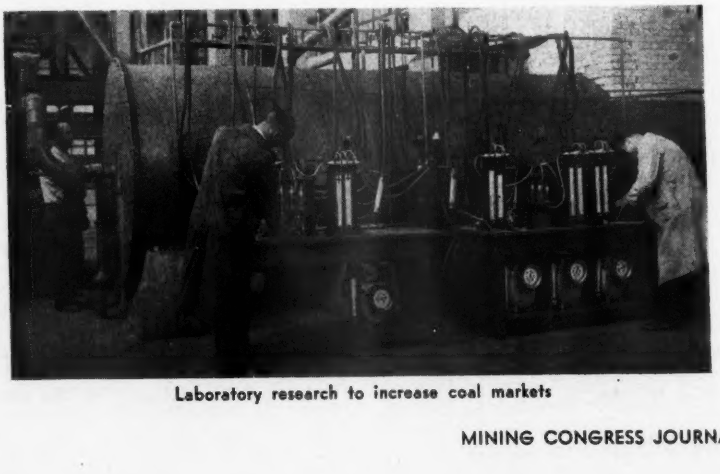
A most significant indicator in these figures is the fact that, to repeat, nearly one-fifth of all dwelling units used oil and gas back in 1940. There were conversions to coal during the war but many of the converters are converting back. The likelihood is that a very large proportion of the 10,000,000 or so new homes estimated to be needed in this country may be equipped to use other than solid fuel. To hold on to what it has and to secure a reasonable share both of the former wood burners and of the new home market, coal has a man-sized job ahead of it on the production, distribution and use fronts.

Development, manufacture, sale and installation of new equipment all take time, and time is of the essence, since competing fuels are now aggressively after all of the domestic heating business they can secure. Fuel costs have become such that in some places at least, coal's traditional advantage of economy is in jeopardy. It therefore is apparent that vigorous measures involving cooperation of producers, shippers and retailers are essential to improve service to and satisfaction of domestic consumers in the use of coal, while development of improved equipment is awaited.

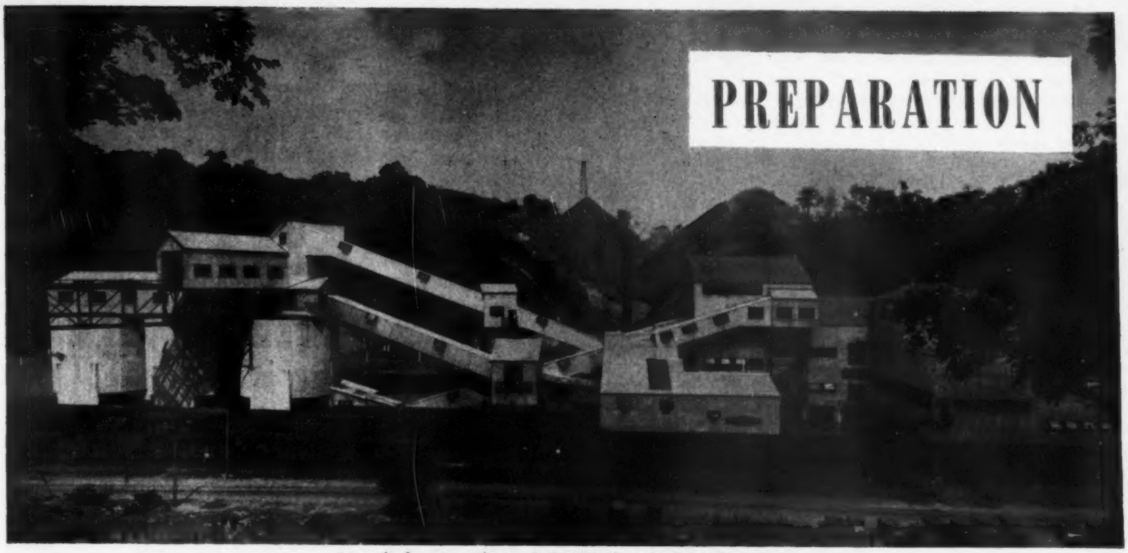
Distribution starts when a carload of coal leaves the mine. From the domestic consumers' standpoint, however, what he sees at his end is all important. And the job of distribution isn't finished until the coal is satisfactorily consumed. Involved here, among a number of other things, are, of primary importance, clean retail deliveries and the availablity of the kind of emergency service, when things go wrong with fuel or plant, that provide to the heating plant owner a sense of security in the use of coal.

Unquestionably our industry as a whole has done a much better job of coal preparation during World War II than was the case during World War I. But the job was not perfect. This is clearly evidenced by thoughtful criticisms registered these days by thoughtful retail coal merchants.

The industry has a tough job in the provision of adequate coal for stoker use. It cannot afford to let down in the standards of preparation of those sizes which will continue to be used in hand-fired furnaces and in stoves. Performance of these jobs rests primarily in the hands of you men who are here, and for this reason discussion of the matter has been given the last and most important place in the development of this subject.



Laboratory research to increase coal markets



A coal cleaning plant of the Pittsburgh Coal Company

Heavy Density Processes for Coal Beneficiation

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D. H. DAVIS
Product Control Manager
Pittsburgh Coal Co.

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Developments in the Heavy Media Process in the United States and Europe Are Reviewed and New Methods Are Discussed for Coal and Slate Separation

IN the past ten years, particularly on the European continent and in England, important developments have taken place with regard to the preparation of coal for the market. The older methods of coal cleaning of which the most important may be grouped as jig washers, trough washers, and classifier washers, have become more or less standardized and their general characteristics and performance are well known. Many improvements, principally of a mechanical nature have been made in such washers, but in general these have involved no radical departure from well-established practice.

The new developments have been the introduction of gravity separation processes by which coal can be separated from impurities on a strictly gravity basis independent of the size of the particles separated. The coal cleaning problems in the United States will undoubtedly become more difficult as the better seams are mined out and as mechanized mining methods put a greater load on the outside preparation facilities. It is our opinion that standard coal washing systems will continue in use wherever the required results can be obtained by these processes without undue decrease in yield of commercially salable coal and where the cost remains low. There will no doubt be cases where the conventional systems will fail to produce the required results and it is in these cases that heavy media will have application. Certainly heavy media washers have shown results with coals that are considered as difficult of treatment by other processes.

Modern heavy liquid processes may be classified as follows:

1. Washing in homogeneous liquids heavier than water (Lessing, duPont de Nemours, Bertrand, Belknap calcium chloride).
2. Washing in suspensions; Chance, deVooys or Barvoys, Tromp, Dutch State Mines—Loess. In America the American Zinc, Lead, and Smelting Company holds license for the Sink and Float separation and American Cyanamid Company are technical and sales representatives for certain patented float and sink processes.

One might well ask for what reason if any should there be a departure from the established methods of coal washing and what are the advantages of the new systems? The principal reason is that by means of a heavy liquid of a certain density, the maximum yield of clean coal at a given ash

content can be obtained with the minimum loss of coal in refuse. Also, with a dense medium a wider size ratio can be treated than when water is used. These are the principal justifications for the use of heavy media for coal cleaning.

The possibility of using heavy liquids for coal cleaning was early visualized because of the practice of using these liquids for control purposes in the coal washers, but these heavy liquids used in the laboratory were too expensive for use on an industrial scale. The use of salt solutions in water, although more reasonable in price, had a practical difficulty of not reaching a high enough density for many coals. There are rather high losses and the cost of reconcentrating the salt solution after being diluted with spray water was found prohibitive in many cases. The inventors then turned to the use of suspensions of dense materials in water.

In general, suspensions of finely divided solids in water are unstable, that is they tend to settle out and this must be prevented by mechanical or other means. If the solids are ground sufficiently fine the suspension becomes more or less stable. Stability due to fineness of division of suspended solids have from a practical viewpoint a serious defect in that the recovery of the suspension after use is also slow and expensive.

An important consideration in heavy media separation is the viscosity of the suspension, which is dependent to a considerable extent on the fineness of the grind needed for a given material and bath density. In practice it is necessary to control both the viscosity and the density, and to maintain the bath density within fairly narrow limits. When the settlement of suspended solids is prevented by means of upward current, it is the "effective" density of the suspension that is important for a static condition does not exist and it is the effect which the supporting currents have on the medium and on the raw coal particles that must be considered. In a dense medium of rather coarse particles, the upward currents are required to support the suspension which in turn support the coal. However, when these currents are strong then the separation is partially that of classification. Aside from gentle currents to prevent settlement of suspended solids, upward currents are only used in a dense medium to obtain an effective specific gravity of separation higher than the actual specific gravity of the suspension, such as in separating a middlings product from a sink product.

Where coals are rather easy to clean the general practice has been to wash a rather wide size range, say 4 in. x ⅜ in, or 6 in. x ⅜ in. However, when coals are difficult to clean and the standard of cleaning is high, such as on the European continent, the general practice is to treat coal of a limited size ratio in one operation and this produces the highest yield at a given ash content. Separate bins are required for each size to be treated in order to maintain a regular feed and the degradation is often considerable. With heavy media it is claimed that feed bins are not required and that intermittent feed can be effectively treated. It should therefore be possible to treat various sizes at different gravities in order to produce maximum yields with a less costly layout.

In all heavy media processes there is a charge for materials used to produce the heavy gravity suspension. In operating practice the rate that media is lost and must be replaced is important. The price of any media depends to some extent on the location of the preparation plant in respect to the source of media and this will undoubtedly play an important part in the selection of the process and the media employed.

In addition to ferrosilicon and magnetite there are other ferrous minerals which may be suitable for preparing heavy media suspensions. These are blast furnace flue dust, rolling mill scale, and grinding wheel dust. A high percentage of the latter material is magnetic and appears to be suitable for coal cleaning at specific gravities of 1.30 to 1.70.

Some heavy media processes produce a middlings in addition to clean coal and refuse. By obtaining control of middlings in a coal cleaning process it would be suitable to blend the middlings at a predetermined percentage into clean coal and thus increase the uniformity of the final product in respect to ash content.

Dense media processes are particularly applicable to the cleaning of large coal, say over 4 in. which generally require separation at rather low gravities, 1.40 or under. Large coal often has low gravity material of poor appearance which must be removed by picking even after washing. Heavy media should enable hand picking costs to be reduced considerably.

There is very little information available on costs of the heavy media processes. It is claimed that feed bunkers are not required and that intermediate surge bins in the plant are not needed. In general, the plants do not require much height and reductions in capital costs are claimed over conventional plants. Due to the more simplified layout the power and labor costs should be lower than conventional plants. The cost of media replacement represents the biggest unknown factor and will determine whether heavy media may compare favorably in cost with other types of plants.

Drying Coal Thermally and Mechanically

Describing the Fundamental Methods of Removing Moisture From Coal and the Uses for Which Each Method is Best Adapted

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LANING DRESS
Preparation Engineer
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EVER since the adoption of wet washing coal came into widespread use, the problem of water removal from the processed coal has developed. The amount of moisture retained on the coal varies a great deal, largely depending on the size particles. In fine sizes the surface area is increased, and the coal tends to mass together making it more difficult for free moisture to escape. The choice of dewatering and drying methods depends upon many factors, such as size of coal, reduction of moisture desired, climatic location of markets, etc.

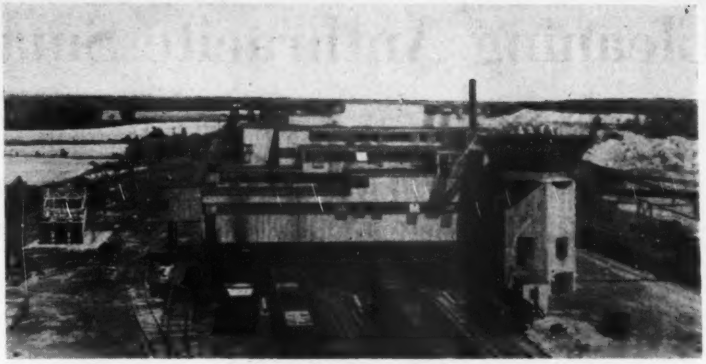
In most cases after washed coal discharges from a sizing shaker or a high speed dewatering shaker into a conveyor for delivery to the loading points, there is a certain amount of free moisture that collects in the bottom of the conveyor. This water comes from the squeezing action of the coal as it is conveyed. High speed shaking screens are generally used in conjunction with classifying or sizing shakers. The feed material to this shaker is usually the volume of water and fine coal that is discharged through the lower deck of a classifying screen.

Vibrating screens are rapidly increasing in the use of dewatering fine coal. In a few instances they have replaced the high speed reciprocating shakers. The advantages of the vibrating screen are the saving of space, less screen surface to inspect and maintain, and a slightly lower operating cost. The action of a vibrating screen in a near horizontal position stratifies the bed of coal. This is contrary to the desired condition for efficient dewatering. The installation of dams or barrages across the screen deck is advantageous in turning the coal over and reversing the position of the particles.

Centrifugal dryers hold an important place for dewatering fine coal. One of their great advantages is the handling of fine coal with a considerable amount of free moisture present. This type dryer will take fine coal feed with as much as 80 per cent free moisture and deliver a product with a relatively low moisture content of 5.5 per cent. Other advantages are the utilization of a small amount of floor space, and the power consumption is not excessive. Centrifugals are usually designed for sizes below ⅜ in. because degradation is a detrimental factor in larger sizes. The "C-M-I" is a continuous dryer of the vertical type consisting of two rotating units, an outside conical screen frame and an inside solid cone carrying spiral hindrance flights. Both units rotate in the same direction, but the screen unit moves slightly faster than the cone carrying the spiral flights. The feed enters the machine at the top and falls down on the cone where the centrifugal force throws it against the screen. It slides down the screen until it meets the upper end of the flights and gradually finds its way to the bottom of the screen cone.

The Carpenter dryer is of the vertical type. The machine consists of a rotating conical unit with perforated screen sections which are cut and rolled to form the surface of the cone. The wet feed material is delivered to a small conical hopper inside the dryer casing and is distributed by a distributing disc to the top of the screen sections in an even layer. The thickness of the layer can be adjusted by raising or lowering the distributing disc. The material is thrown against the top screen section and starts to progress downward releasing moisture as it advances over the screen surface.

The Bird Centrifugal Filter is primarily used for dewatering slurries. It is a horizontal type, and unlike the Carpenter and "C-M-I," it requires no baskets or screens. This machine has two rotating units, a bowl and a screw conveyor. The bowl is in the shape of a truncated cone. The screw conveyor rotates inside the bowl at a slightly lower speed in the same direction of rotation. The



A Pyramid preparation plant

solids are moved forward by the conveyor as fast as deposited, being carried above the level of the effluent or filtrate for an interval before leaving the bowl. Adjustable effluent discharge ports are located in the large end of the bowl so that the level of liquid is maintained at a desired height. The dried product and the filtrate are discharged continuously at opposite ends of the bowl which can be conveyed where desired.

Generally speaking, when a product is desired to be thoroughly dry (0 per cent surface moisture) the selection of a thermal drying unit must be made. The factors that should be taken into consideration before making the selection of a heat dryer are as follows: Size of coal to be dried, amount of floor space to be utilized, installation cost, and power requirements.

The Raymond Flash Dryer system is primarily used for drying fine sizes of coal. The hot gas (1000° to 1400° F.) is drawn into the system by a fan connecting to the cyclone collector vent. The coal to be dried is continuously introduced into the hot gas stream by a mixer. The dry coal and moisture laden gas is drawn into the cyclone collector. The dry coal drops to the bottom of the collector and the moisture laden gases are discharged by the fan to the atmosphere.

The Christie dryer is of the rotary kiln type. The high temperature furnace gases (1000° to 1200° F.) pass around a short section of outer shell at the feed end, through nozzles to the central flue, and travel toward the discharge end. The gas enters the space between the outer shell and the flue. The hot gas then returns flowing in a counter direction to the material and is withdrawn with the moisture by an exhaust fan.

The Roto Louvre dryer is a drum type dryer that consists primarily of an outer shell and on the inside of the shell louvre plates project radially and are parallel with the drum. The plates overlap to form a circular inner shell that gradually increases in diameter, upon which the material is carried as it progresses through the dryer. This arrangement provides longitudinally compartments or channels for the hot gases (900° F.) underneath the bed of material. A full length outlet for the passage of hot gases into the materials is provided by clearance between the overlapping plates or louvres, which are shaped to prevent the material from falling into the hot gas channel. Hot gases are introduced by a manifold into the channels that are only beneath the bed of coal in a slowly revolving drum.

The Multi-Louvre dryer is a new development in heat drying. The principle of the unit is the passing of hot gases through a constantly mixed bed of material by a series of traveling louvres. The louvres cause the material to be turned over many times as it flows back over itself. The hot gases are drawn through the moving mass of materials and is exhausted at the top of the dryer.

The reciprocating screen heat dryers are fundamentally quite simple. The principle is to pass high temperature gases either up through or down through a moving bed of material on a reciprocating shaker screen. One great advantage of the screen type dryer is that degradation does not present much of a problem.

The McNally Vissac dryer consists essentially of two declined reciprocating screen decks. The removal of the moisture is accomplished by passing hot furnace gases, tempered with cold air, downward through the bed of coal as it travels along the screens. An induced draft fan, located at the exhaust end, supplies the motive force for the gases.

The Link Belt S. S. dryer is a reciprocating shaker enclosed in a drying chamber. The material is passed through the drying chamber in a thin bed, requiring a short retention period. The drying medium is drawn down through the bed of material by a fan and then exhausting to the atmosphere. Dryers of this type will handle a large capacity of coarse size coal.

Cleaning Anthracite Small Sizes

Practice in Reducing Washery Losses and Reclaiming Waste Product in Small Sizes Has Shown Consistent Development in the Anthracite Field

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Pierce Management
Scranton, Pa.

EVEN though the accomplishments of the coal industry during the war years were not as spectacular as those of many defense industries, they do represent progress accelerated by the demands of a Nation at war. Already, in the anthracite industry, coal cleaning processes more fully developed during the war are contributing meritoriously to the current demand for coal. And the new uses then found for fine anthracite sizes will, no doubt, carry over into post-war years.

Anthracite coal is cleaned in accordance with certain standards approved by the anthracite operators. The steam size group includes the sizes No. 1 Buckwheat and smaller. In many instances, the small sizes No. 4 and No. 5 Buckwheat are cleaned in accordance with consumer specifications.

TABLE I
ANTHRACITE SPECIFICATIONS

Size	Test Mesh Round Through Inches	Test Mesh Round Over Inches	Maximum Impurities Slate %	Maximum Impurities Bone %
Broken	4 3/8	3 1/4	1.5	2.0
Egg	3 1/4-3	2 7/16	1.5	2.0
Stove	2 7/16	1 5/8	2.0	3.0
Nut	1 5/8	13/16	3.0	4.0
Pea	13/16	9/16	4.0	5.0
			Ash	
Buckwheat No. 1	9/16	5/16	12.0	
Rice	5/16	3/16	13.0	
Barley	3/16	3/32	15.0	
Buckwheat No. 4	3/32	3/64	15.0	
Buckwheat No. 5	3/64	....	16.0	

For many years after anthracite coal was first mined, the steam sizes were not considered marketable, and they were discarded on refuse banks, many of which have been recleaned at a profit. In fact, some old banks have been recleaned the second time. In 1890 only 2 per cent of the sizes smaller than No. 1 Buckwheat were marketed, while in 1940 21.4 per cent of them found a market. In 20 years, 1924 to 1944, the percentage of the shipments that was steam sizes increased 50.7 per cent, while for a 30-year period, 1914 to 1944, the increase was 50.0 per cent. As the fuel became more marketable, its price increased—in 20 years the price increased 64.1 per cent.

Most of the small anthracite sizes are used to generate steam in large electric generating plants; and to make this possible, the development of stokers and other combustion accessories was necessary. Forefronting the list of consumers of this fuel is the Pennsylvania Power & Light Company with plants in the anthracite coal mining area which burn 2,250,000 tons annually.

For the past 25 years anthracite small sizes have been briquetted successfully and at a profit, but not on a very extensive scale. In 1944 there were produced 1,400,000 tons of anthracite briquettes. This method of using small anthracite sizes was brought into prominence in 1945, when a large operating company decided to build two briquetting plants with a combined capacity of 2,000 tons daily.

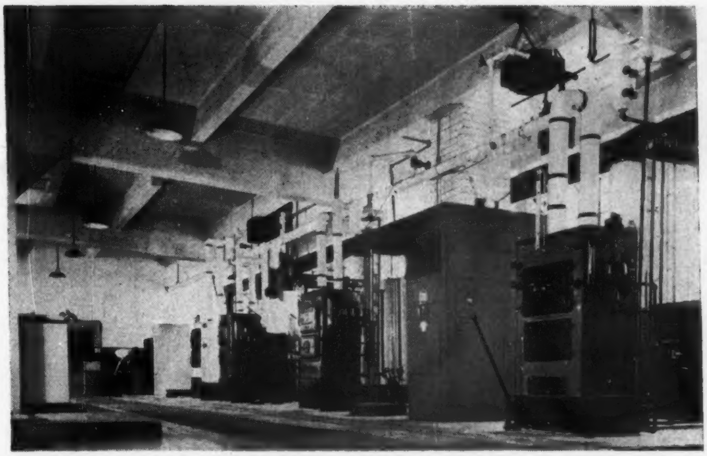
In the Philadelphia area, there was recently placed in operation a plant manufacturing a fuel known as the "White Glove Packaged Fuel." It contains about 75.0 per cent of No. 5 Buckwheat, 25.0 per cent of bituminous coal, and an oil base binder; all compressed into 3-inch cubes. Six cubes are wrapped in paper, and thus milady can handle them without soiling her "white gloves."

Just within the last two months, burning tests were made of pelletized anthracite small sizes, the slurry from a Door Thickener installed to prevent stream pollution. The pellets, made in an extrusion press, are in the form of short rods of varying lengths (about ¼ to ¾ in. long) and ⅛ in. in diameter. The tests were conducted on a Coxe traveling grate, 4 ft. wide by 40 ft. long, and they demonstrated that pelletized anthracite can be burned successfully on the foregoing type of grate.

Sources of Anthracite Small Sizes

Several years ago when large consumers of steam sizes were considering their exclusive use, much thought was given to their availability and to the permanence of the supply. As long as anthracite is mined there will be a supply of those sizes, but currently their production from deep-mined coal is being augmented by the following: recleaning refuse banks containing a high percentage of fine anthracite sizes; outcrop strippings which generally produce a product containing more fines than deep-mined coal; plants constructed to remove the by-product from breaker waste-water; and river coal. Facilities designed to remove silt from breaker waste-water have made it possible, at some breakers, to reclaim No. 4 and No. 5 Buckwheat, providing cleaning equipment

was installed to produce a product having an ash content that would meet the trade requirements. Since 1890 the streams and rivers draining the anthracite area have been a source of small sizes. In 1944, 1,-373,000 tons of barley and smaller sizes were recovered with a value of around $2,000,000. A floating dredge seems to be the most practical method of reclaiming this material. In June, 1944, the Hauto Coal Company placed in operation its Hauto Breaker, located just a few miles north of Lansford, Pa. It specializes in cleaning small anthracite sizes to meet current precise specifications concerning ash content and sizing. Coal for the breaker comes from two refuse banks deposited many years ago, but containing sufficient coal to warrant recleaning.

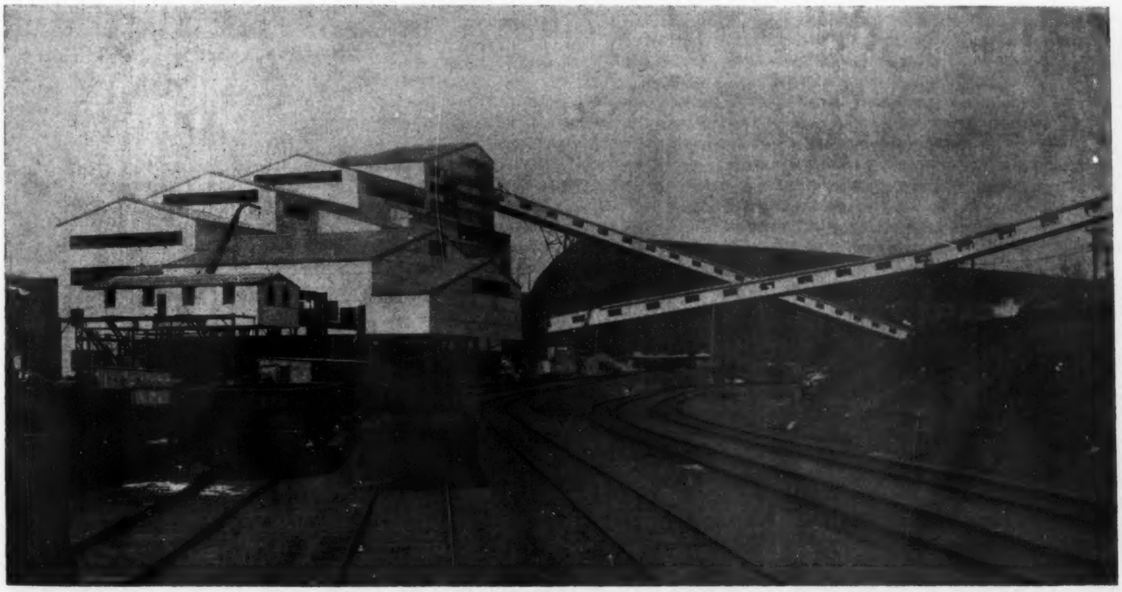


Combustion tests by Anthracite Industries, Inc.

An outstanding installation to reclaim anthracite small sizes is the froth flotation plant of the Lehigh Navigation Coal Company. It has a capacity of 40 tons per hour obtained from 7,000 GPM of breaker wastewater. The feed is raised by four diaphragm pumps from a 75-ft. hydroclassifier to a 10-ft. hydroclassifier tank. In this tank the larger size solids with a relatively low ash content settle, and are gathered and raised by a diaphragm pump to two vibrating screens for dewatering and screening out the high ash fines. The overflow of tank which consists of the finer size solids and the underflow of screens is directed to the 12-ft. conditioning tank in which the reagents (pine and fuel oil) are added in measured quantities by the reagent equipment on the top floor. The conditioned material from tank is split and fed into two banks of four 100 cu. ft. froth flotation cells for primary or rough cleaning.

Recently a concentrating table plant was placed in operation to clean small anthracite sizes which were bought from a mining company operating a large breaker. The plant is located several miles from the breaker which makes it necessary to transport the uncleaned coal to it in railroad cars. Under these conditions the breaker operating company receives an income from what previously was a by-product, and thus avoids an investment in the cleaning equipment which would be required in its breaker to clean the product sold to the small size coal cleaning company. Perhaps there is a trend to the construction of central small coal cleaning plants for the purpose of cleaning the by-product from several breaker operating companies.

Generally speaking, small anthracite sizes result from crushing the larger sizes by rolls in breakers, from breakage due to blasting when the coal is mined, and from beds of coal which contain an abnormally large percentage of fines. All other current sources of supply help to meet an accelerated demand which seems to have good future prospects. Keeping pace with an increased demand and more rigid specifications is a cleaning technique which now meets and will continue to meet consumer specifications no matter how precise they become. And that is as it should be and will be, if a market for small anthracite sizes is to be maintained and increased.



St. Nicholas Breaker of Philadelphia and Reading Coal Company

Mechanical Mining in Thin Seams

Mining Operations are Described in Low Coal With Mobile and Stationary Loading Machines, Also Conveyors With Hand Shoveling

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JOHN J. SNURE
Assistant Production Manager
Rochester and Pittsburgh Coal Co.

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THE rapid depletion of the higher and more economically operated coal has forced a greater production from thin seams which a few years ago most companies would have considered impractical. Low height coupled with increased wage rates, labor contracts unfavorable to mechanization, quality requirements of the consumer and added competition from other fuels mean that we must have more efficient face equipment and at the same time it must be managed more efficiently than we ever did with hand loading.

Mechanical loading equipment was originally planned and built for the thicker seams because it was considered impractical to compress heavy equipment to a height for low coal. Necessity, however, has brought both the manufacturer and coal producer to realize the extreme need for this equipment, so at present there are several types for low seams.

The problems of mechanization multiply as the height of coal decreases. *This* means better planning, more careful choice of equipment, better selection of manpower, closer and better trained supervision and above everything, experienced and thoroughly trained maintenance. It is, therefore, paramount that we have a mechanization program which will increase the productiveness of not only the workman, but the supervisor and everyone who has a part in the program. We must not only plan for face equipment, but machinery to simplify the movement of supplies and equipment. Several manufacturers are now producing trucks of some kind to expedite this moving.

Serious consideration should be given to spare equipment for replacing machines broken down, being overhauled or rebuilt. This is more important in low coal because it is impractical to move equipment from one section to another. It means having spares at all strategic points.

Face supervisors for mechanical loading in thin seams should be mechanical minded and be able to visualize what their men are doing and what their sections will look like a week or two ahead. The maintenance supervisors and mechanics should have a thorough training course on the equipment they are going to maintain, either at the factory or the equivalent before it is delivered, then as more equipment is ordered additional mechanics can be trained by a *regular course* set up on the job. Maintenance men *must* be fully trained before they are turned loose on $12,000 to $20,000 equipment.

In one mine ranging from 36 to 44 in. caterpillar mounted mobile loaders dumping on high capacity conveyors are doing a satisfactory job and now that higher capacity loaders as low as 30½ in. are available, we believe production can be increased by using them and speeding up the present conveyors or changing to larger conveyors. One loader, one caterpillar machine truck, one mining machine, a coal drill and a 30-in. conveyor belt are used to develop a three entry 2,200 ft. butt heading. Five men at the face, a boom man, a me-

chanic, and one-half supply man produce about 120 tons per shift.

Another mine with a seam height of 40 to 42 in. and using the same mining system is doing a very satisfactory job loading into shuttle cars with the high capacity caterpillar mounted mobile loader. A loading machine, one 9-ft. bar cutting machine, one coal drill, one caterpillar truck, two shuttle cars and an entry belt are used on development. This set-up with 10 section men produces 200 to 250 tons of material. When the headings start back, a second machine set-up is put on production and the section is retreated with a loader working four rooms on each side. These two loading machines produce from 650 to 750 tons of material with a crew of 25 men.

Studies have been made recently in this type of mining and it is found by using three shuttle cars instead of two behind a loading machine, production can be increased 12½ to 15 per cent.

Shortwaloaders discharging on high capacity conveyors are now in operation and doing a good job. In developing thin seams, as far as speed is concerned, this machine has no competition; three of these working double shift in three developing butts with three men crews and two supply men have driven 1,100 ft. of heading in one calendar month. There is a tendency in low coal mines today for a small number of working places and small crews with more tons per man and as the shortwaloader stays permanently in one place it is very adaptable to this principle.

Self-loading shaker conveyors, discharging on belts, are being used successfully. This equipment stands up well under the average mine use and has a minimum of outages and generally very low maintenance. The same mining system is used as described above, a shaker conveyor driving each of three butt entries in development, discharging on a butt belt. Eight men are used at the face and produce approximately 150 tons.

As we all know, our wage scale does not permit bonus or incentive payments to our men and in thin seams, especially where the working conditions are uncomfortable, creating a clean competitive and cooperative spirit is one of the answers. Progressive companies are thinking of management that encourages a friendly competition in doing a good job—maintaining safety standards, good housekeeping, efficient working conditions and sound equipment, which will result in good production from *each* crew. Mechanical mining in thin seams can be successful if management: First — Selects the proper type of mechanical equipment; Second—Employs and trains a good type of worker; Third—Provides a high type of supervision.

Mechanical Mining In Thick Seams

The Development of Mechanization in Northern West Virginia Has Resulted in Many Changes in Operating Systems and Mining Methods

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Production Manager
Consolidation Coal Company

THE title of this paper, "Mechanical Mining in Thick Seams," may be somewhat of a misnomer, since it deals with mechanical mining in the Pittsburgh seam only. When assigned this subject, my first reaction was to present several systems observed in different parts of the country in thick seams. However, I soon found this would develop into a paper entirely unreasonable in length and I decided to confine it to the systems in the Fairmont field of the Pittsburgh seam. These systems may or may not be applicable to other areas, but for the benefit of those who have not had the opportunity of studying our conditions, I will present them for what they are worth.

The first mechanical mining was introduced in the Fairmont field about the middle of the 1920's. There had been some experimental work done with the McKinley Heading Driver during the early 1920's, but the first real tonnage loaded was accomplished several years later with Joy 5-BU's. During the latter part of the 1920's, due to low wage rates and a particularly critical market condition, the use of loading machines by the larger companies was pretty much discontinued. However, some of the smaller operators began to make inroads into the markets, and forced the larger companies to go to mechanical mining.

Caterpillar mounted loading machines predominated in this field for several years until the track loading machines began to assert themselves, and with the introduction of track loading machines some of the operators began the use of shuttle car haulage in conjunction with caterpillar loading. There are numerous successful types of loading machines, both track and caterpillar mounted, in this field, operating at the present time, and this paper will

Shearing to improve coal sizes

try to present in a very sketchy way, some of the systems that are in vogue.

When loading machines were first placed in the mines, it was, of course, expected that they would have to perform under the conditions which were developed for hand loading. This is natural, since most of the mines in this country have been in operation for several years, and a good part of the development was already made. However, after the equipment was installed, it did not take long to find out that the practices followed in hand loading would have to be modified for mechanical mining. This forced the operators to begin to think of new systems of mining.

What system to use? The answer is not so simple. There are several factors that should be taken into consideration, such as type of equipment, thickness of seam, contours of the bed, value of coal, value of surface, the structure and amount of overburden, gassy or non-gassy conditions, proximity to cities, rivers, lakes, etc., and numerous other things that have an important part to play. To sum it all up, it takes a great deal of study by a competent mining man to lay out a system for any given locality or type of equipment.*

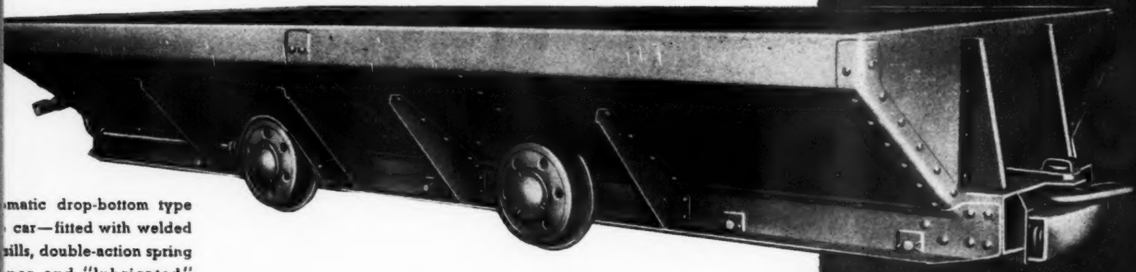
Safe drilling in high coal

As we pointed out in the earlier part of this paper, the Pittsburgh seam is overlaid with a bed of draw slate. If this draw slate is exposed for any period of time it rapidly disintegrates and causes a great deal of roof trouble. In studying the field as a whole, it seems the answer to successful pillaring in the Fairmont Field is rapid extraction. Rapid extraction means high capacity and high concentration, even at the expense of maintenance, and possibly at the expense of some confusion as the result of multiple shifting. There is no question in our minds but that it requires a much higher type supervisor to handle the triple shift proposition than where only single or even double shifting is practiced. Also, the maintenance problem is considerably magnified on any multiple shift job. This is simply by reason of not having any time in which to make repairs to the equipment.

This then raises the question of how to lick the maintenance. We believe the answer to that is having extra equipment and engaging in the practice of preventing maintenance rather than eternal patching. There has been a world of talk about preventive maintenance, but in our particular locality it has been mostly talk, and little, if any, carefully laid and well executed plan. We are determined to establish a system of overhauling or completely rebuilding equipment at certain intervals. So far we have not definitely established the time element for each type of equipment, but in recent months we have done some overhaul jobs which we are fully convinced have paid for themselves. To take machines completely out of service and put them through an overhaul job means, of course, extra equipment, but we believe that this is the answer to our maintenance problem.

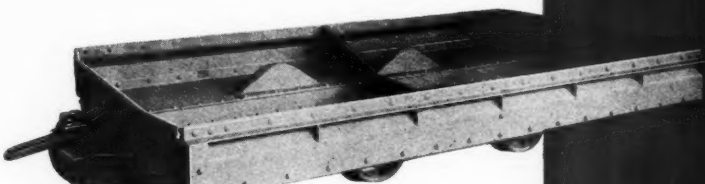
* EDITOR'S NOTE: Mr. Higinbotham then presented a series of seven slides, illustrating mining systems in the Fairmont field and describing the transition from hand to mechanical loading.

Shuttle car operation of Consolidation Coal Company

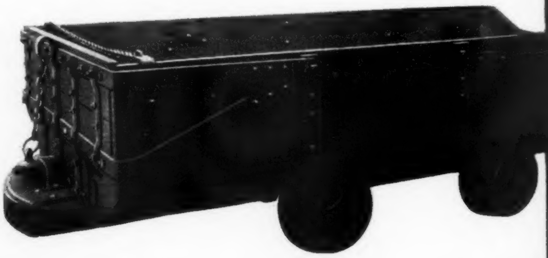


matic drop-bottom type car—fitted with welded sills, double-action spring per and "lubricated" s. Anti-friction bearings e wheels.

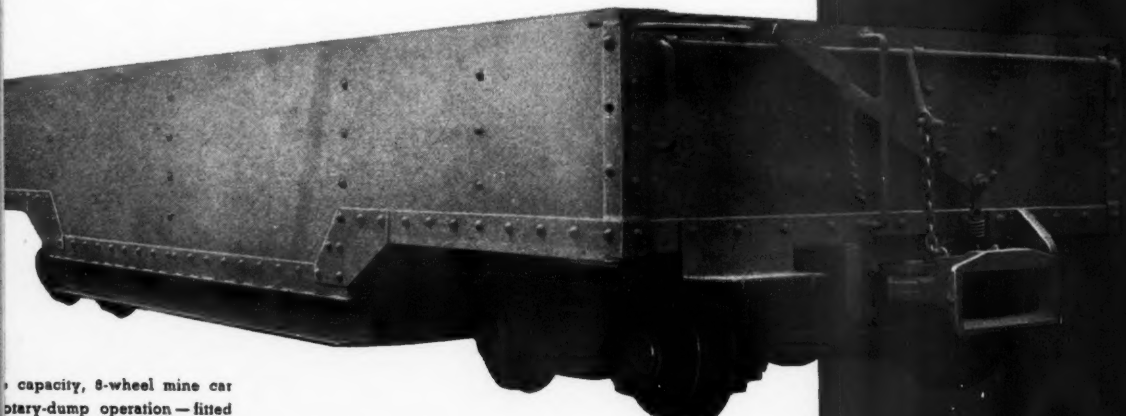
-dump type, all-steel, four- mine car—fitted with ded end sills and double- on spring bumper. Anti- ion bearings in the wheels.



y-dump type, all-steel, axle mine car—fitted welded end sills and le-action spring bumper. riction bearings in the ls.

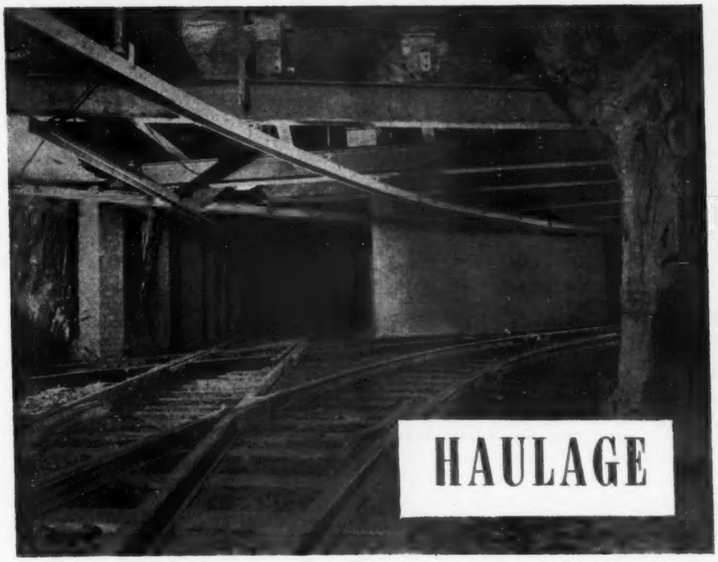


dump type, composite, d and steel, thru-axle car. Anti-friction bear- n the wheels.



capacity, 8-wheel mine car otary-dump operation—fitted automatic couplers and four- l brake. Anti-friction bearings

Underground Haulage With Locomotives and Mine Cars



Interesting Problems Are Presented by Equipment and Construction Methods Which Affect Economies and Performance of Underground Track Haulage Systems

★

C. R. NAILLER
General Manager
and
C. C. HAGENBUCH
Assistant to Vice President
Hanna Coal Company

★

TRACK-MOUNTED haulage equipment is still the most widely used method of underground coal transportation. Excepting certain cases where special conditions govern, it may be stated that, in general, locomotive and mine car haulage can be operated as efficiently, from a mine production standpoint, as any other transportation equipment. Mine car and locomotive equipment also enjoys added advantages as compared with other transportation methods in that the first cost of the equipment is less and a considerable range of flexibility is available.

A discussion of locomotives necessitates their classification in accordance with the type of job they must perform. The main line haulage locomotive of today and the future is one capable of performing its work at high speed. Haulage systems using locomotives that are slow and too small for the job invariably are forced to employ too many units. In addition to the increased labor cost, capital expenditure is high because of extra locomotives and mine cars, maintenance and inspection is more costly, dispatching and signal systems are more complicated and congestion on the mainline at passways and terminal ends cause delays and loss of time.

Some of the arguments against large, high speed, haulage locomotives include charges of high maintenance, too heavy a unit for normal rail weight, difficulty in negotiating curves, dimensions of locomotive too large and high peak power consumption; in general answer to these questions, it can be said that several American locomotive manufacturers are now offering high speed haulage locomotives, whose improved design precludes many of these objections.

The other two principal classes of haulage locomotives are the secondary or swing locomotive and the gathering, or service locomotive. The latter usually is a cable reel type having a top speed of four to five miles per hour. The development of large capacity mine cars has necessitated increasing the weight of the gathering unit and it has been generally accepted that a locomotive of slow speed rating has better control over the spotting and handling of mine cars under the boom of the loading machine. In order to further increase the efficiency of the coal production unit, and permit the gathering locomotive to give all of its attention to servicing the loading machine, many mines are equipping their secondary haulage locomotives with cable reels, making it almost a duplicate of the gathering unit. In recognition of this trend, manufacturers are offering eight to 10 ton trolley-reel locomotives having a rated speed of five miles per hour on the cable, and six to eight miles per hour on the trolley. These units offer the operator an opportunity to use a minimum of spare equipment.

Improved loader performance has been demonstrated to be directly related to high capacity mine cars. The ideal, continuous operation of the loader can be approached by use of a well designed mining system, proper track and gathering locomotives and large capacity mine cars. Coal oper-

ators and mine car manufacturers have an entirely new perspective as to the size of a mine car which can be used in a given seam; eight-wheel cars up to 20 ft. in length and four-wheel cars longer than 10 ft. in length are now considered practical.

The continued development of run-of-seam loading has again raised the horizon on car capacities. Loading machine manufacturers are being forced to redesign the loading booms of their machines to obtain the length with sufficient strength to keep pace with the development in car lengths. Mine car loading per wheel can still stand considerable increase before reaching the loadings usually encountered in the large cutting and loading equipment.

The faster the cars can be loaded, transported outside, dumped and returned to the loading unit, the fewer cars are required for a given tonnage. The operation of cars at high speeds is successful when proper track is provided. In general, eight-wheel type cars will have better roadability at high speeds than four-wheel cars. The best haulage system is that which is capable of efficiently handling the maximum face production of the mine for which it is designed, at a low transportation cost and without interruptions of the face loading operation by derailments or wrecks. A haulage system of this type can be secured only by preliminary study and keen engineering attention to the essential details which, in combination, will achieve the desired result, i.e., a modern, speedy, non-failing, low operating-cost transportation system. Among the essential details which should be analyzed and decided upon before construction are: track layout and progressive location of passing tracks, allowable maximum grades and minimum curve radii, weight of locomotives and size and capacity of mine cars, track weight and tie size, shift production, type of construction, drainage and ballast, track life, automatic switches and block signals, outer rail elevation on curves and a proper dispatching and telephone system.

Having these governing factors set up, the next specification to be determined is track weight and tie size. The track must be of sufficient weight to carry the load that passes over it with a proper factor of safety and the ties of sufficient number and bearing surface to properly support the load they carry and distribute this load to the ballast. It is also essential that spike grip and spike support be considered in the selection of overall length and thickness of mine ties. Finally the matter of life of the various subdivisions of the transportation system must be estimated and decision made as between use of treated or non-treated ties.

Mine haulage systems are underground railroads and because of their ever-increasing length and growing speed requirements they demand and deserve a maximum of engineering planning in their installation and developments. Derailments and wrecks need not occur, although not so many years ago they were considered a necessary evil. Main haulage roads are built for the life of the mine and to insure reliable, delay-proof operation are worthy of a relatively high first cost. Such an installation, with a proper maintenance program, will provide an adequate, profit-producing method of haulage between face and tipple.

Underground Haulage With Belt Conveyors

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RAY COBB
Superintendent
West Kentucky Coal Company

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Belt Haulage Underground Involves a Number of Diversified Factors, All of Which Must Be Studied to Assure Maximum Operating Efficiency

ACCORDING to the information available, the first belt conveyors for underground mining in the United States were installed during 1929. The first 100 per cent belt conveyor mine was started in 1934. This was in a seam ranging from 28 in. to 42 in. in thickness in Eastern Kentucky. This installation was followed by others in Ohio in 1935, and then by others in most all of the coal producing states. While the early installations were made in relatively thin seams, several have been and more are being installed in the thicker seams. There is now in operation in coal mines in the United States a total of approximately 130 miles of belt conveyors.

Since 1940 our company has installed and operated three mines in which belt conveyors are used exclusively for haulage from the mouth of the room to the tipple. A fourth mine is being completed and is in the development stage, it also being equipped with belt conveyor haulage. The three mines now in operation have a combined daily output of 10,000 tons, two-shift operation. The thickness of the seams being worked varies from 4½ ft. to 6½ ft. Due to irregularities of roof conditions, the maximum clearance in the lowest seam is less than 4 ft., the grades varying up to 10 per cent. All belt conveyors now in use are 30 in. wide except that in North Diamond Mine, where we have one mile of 42 in. conveyor. The maximum length of conveyor line so far installed from the bottom of the slope to the face of the coal is 10,000 ft. The maximum length of a single section is 2,500 ft.

Poplar Ridge Mine, daily output 2,600 tons, which is the lowest seam being operated, slopes on a maximum pitch of 5 per cent uniform grade down and the main haulage conveyor is operating up the 5 per cent grade with the cross entries level and the panel entries on the one side driven down and on the other side up the 5 per cent grade.

Hecla Mine, daily output 2,600 tons, is operating in a 4 ft. 10 in. seam which lies fairly level with the exception of a 40-ft. vertical displacement in the strata extending in a fairly straight line across the territory, which is crossed at two different points as shown in Fig. A. Two pairs of rock slopes were driven on a 15 degree slope, which were about 200 ft. long and the belt conveyor extended down them to the lower level and development and operation was continued without appreciable delays or cost.

In North Diamond Mine, which is the first mine opened and which has a daily output of 4,800 tons of raw coal, two shifts, the conditions are normal, the seam is 6 ft. thick and grades fairly level. We have at present in operation in this mine one mile of 42-in. belt conveyor which was in three sections due to turns in the entry necessitated by natural conditions. This belt is run at a speed of 500 F. P. M. and is loaded at three different points by 30 in. conveyors which, when fully loaded, discharge at the combined rate of about 800 T. P. H. onto the 42-in. belt.

Belt Loading and Unloading

With high capacity loading of the panel conveyors and consequently of the main haulage conveyor, it is necessary to provide a surge hopper at the end of the main haulage system if a uniform flow of coal to the preparation plant is desired. The capacity of this hopper can be determined only after a careful analysis of the loading cycle, number of units loading, room haulage, etc., but as a general rule, a hopper to hold 50 per cent of average capacity for the period of a face loading cycle will be ample for this purpose.

In conveyor mining it is often necessary to operate an extra branch conveyor for development purposes which, if allowed to discharge on the main conveyor with the regular branch conveyors would surge or overload the main conveyor. To prevent this, an automatic control device is installed under each belt, which, when loaded, will deflect sufficient to contact a lever which opens the control circuit and stops the branch belt only when both the branch and main conveyor are loaded, and starts the branch conveyor again as soon as there is an empty space on the main conveyor.

All conveyor drives are equipped with remote push-button control with automatic acceleration. Each succeeding conveyor drive in a continuous system is interlocked electrically with the drive of the preceding section to prevent starting until the succeeding one has accelerated. As an additional safety precaution, at each discharge point a simple "butterfly" stop switch is installed which is opened in case of a gorge by a lump of coal falling from the chute.

At each discharge point, skirt boards and a discharge chute are provided. For angle loading at intermediate points, a counterbalanced chute is provided to permit lumps already on the conveyor to pass under the chute which is tipped up by the passing lump of coal with the aid of the counterweight, thereby preventing undue impact on the belt.

Belt Conveyor Maintenance

We have not found a substitute for careful and diligent maintenance to obtain satisfactory performance. The number of men necessary to maintain a conveyor haulage system is relatively small and most of the work can be done by semi-skilled labor with little hard manual exertion necessary; but these men should be constant in their attendance with no other duties. The job as beltman is considered a preferred one around the mines and there is usually no special trouble in obtaining belt maintenance men.

While most of our belt splices at the present time are mechanical, we have found to vulcanize all main line belt splices eliminates much work in repairing, reduces belt damage, leakage of coal and power requirements. Most of the belt damage starts at a splice. To the present time, it has been necessary to replace about 25 per cent of the total belting in service.

Some of the advantages of belt haulage are:

The simultaneous starting by push-button control of a constant flow of coal from all sections of the mine to the tipple, enabling all sections to start producing immediately.

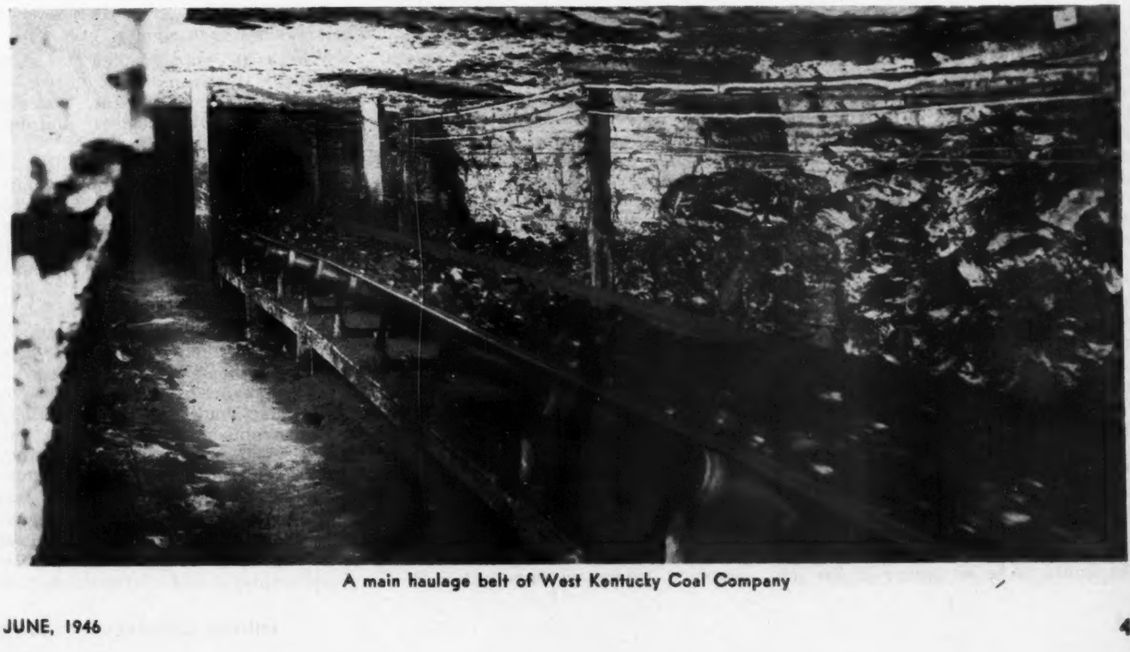
Minimum delay due to haulage, the actual time lost over a period of years being negligible.

Minimum supervision of haulage systems, enabling the supervisory force to concentrate almost entirely on the face operation.

Constant uniform power requirements with lower demand.

The elimination of accidents almost entirely, being less than 4 per cent of the total accidents, and those of a minor nature.

The wide range of application and capacity with a minimum variation of the initial installation. Belts of a large variation in width and capacity can be applied to seams varying from minimum to maximum thickness, level to 20 degree pitch either in favor or against the flow of coal, irregular grades, bad drainage and soft bottom conditions.



A main haulage belt of West Kentucky Coal Company

A modern surface plant of Island Creek Coal Company

Modernizing the Mine Organization

Some of the Major Problems of Management Are Discussed as Well As Methods of Improving Personnel Relations

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R. E. SALVATI
Vice President
Island Creek Coal Company

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THE unforgotten man of a mine organization today is the foreman. There has been much said by top management but little has been done by most coal companies; and, while I am sure many companies in the past two years have given this matter serious consideration and have done a great deal about it, a great many companies yet have much to do to place foremen in their proper place and position.

Some coal companies have foremen —or so-called foremen—in a position or job where they actually perform manual work. I know of several companies where foremen actually operate loading machines, cutting machines, etc. These men, who perform such duties, are nothing more than "leaders." They should not even be considered as foremen.

The foreman resents his authority being diluted. He wants a job with responsibility. He wants the sort of pay that indicates that he has a responsible job and is commensurate with the efforts he puts into his work. He wants to be as secure in his job as other members of management—the sales manager, for instance—the personnel director, the cost accountant, the superintendent, the general manager. The foreman wants, and is entitled to, recognition and respect.

The matter of promotion or advancement, also bears strongly on the foreman's conception of his job and responsibility. A representative group of foremen asked about their own personal objectives in life told the questioner they would like (1) advancement, (2) higher pay, and (3) security. How the foreman is paid has a great deal to do with his sense of responsibility. The surest way to leave a foreman under the impression he is no longer a part of management is to pay him less than the man he supervises . . . says Anderson, vice president of General Motors. A feeling of insecurity adds greatly to a foreman's discontent. Robert Keys, president of the Foremen's Association of America, said, "What foremen need more is the right to hold our jobs; we want the companies to recognize the years we have put in."

What can management do about all this? How can we modernize our mine organization? What, basically, are the foreman's desires, and how can they be satisfied?

Not too long ago, a committee selected from the directors of the Southern Coal Producers' Association studied this problem (of supervisors) and proper plan and/or suggestions to be worked out to offer top management. I was chairman of that committee and I can present no better plan than to give some of the suggestions that will help create better relationship with management. In other words, here are some suggestions to "Modernize Your Mine Organization."

The establishing of a distinct line, above which all employes definitely will be part of management and below which all employes definitely will be a part of the labor group. Also, here should be included as part of management all technical and professional employes and advisers. A most

important item to be given consideration in establishing a correct status for a foreman or supervisor is a proper wage. It is not sound policy to adopt a system where, as a general rule, a workman has a greater income than his boss who directs the work and who bears the responsibility for production, for costs, for maintenance and for safety within his own jurisdiction. If no additional remuneration goes with supervision there is no incentive to assume its responsibility. A monthly salary gives the supervisor an assurance and confidence in himself that he cannot enjoy when he is on an hourly basis. Hourly wages give him a feeling that he is just a "shift boss" —a boss who has only very limited authority that begins and ends at a stated moment. It places consciously or unconsciously a barrier between him and his more fortunate superior who is a salaried man, which automatically carries with it some distinction and prestige.

A salaried man feels a sense of obligation to his work just as much when he is off duty as he does in his busiest productive hour and is ever alert for conferences with superiors, for contacts with the workman, and for emergency needs. Not so with the hourly man who sells his time and effort for only certain hours within the limits of the day and who, separate and apart from those hours, feels no sense of obligation or duty.

Executive management should encourage and seek the observations and suggestions of the foremen upon production, personnel and operating problems.

(a) Foremen should be encouraged to make suggestions on production, personnel or operating problems; it is desirable for foremen to be free to express their individual judgment or ideas.

(b) Too frequently management asks foremen for their suggestions and, instead of giving them the opportunity to express themselves, continues to monopolize the meetings and conversations and thereby restricts the foremen's freedom of expression.

(c) In meetings where ideas and suggestions from foremen are solicited it is desirable that executive management make every effort to keep them on a friendly and informal basis so that foremen may feel at ease and free to express themselves fully.

In order that a supervisor may secure and maintain from the workmen under his supervision proper respect and loyalty they must know that he directs with authority. He should be kept so closely informed of the policies and methods of the company with reference to supervision that he will be able to at all times answer questions of the workman and without delay pass on all problems that arise.

To be specific, workmen dislike delayed decisions, in matters affecting them and a superior or supervisor who can give an answer quickly adds to his prestige and increases the confidence and respect which the men place in him. That prestige can only obtain when the supervisor is *delegated all the authority which the responsibilities of his position require.* The extent to which a foreman or supervisor is capable of assuming and intelligently carrying out such duties is measured by the *care with which he is chosen* and by the *training he receives.* The initial responsibility for the prestige of a foreman or supervisor lies with top management, and its full support must be given thereto.

The Army has given a splendid example of value of carefully selecting candidates for Officers' Training Schools. The same general rules may well be applied in selecting prospective supervisors. The more careful the selection the smaller the failures

on the job, and the cost to the company will be much less during the probationary period. Supervisors chosen unwisely may be very expensive to the company. No one can be selected who will at once perform at high rate of efficiency, for, regardless of how well his fundamental character and ability fit him for leadership, only through experience and training can he fully master his work. However, it is undeniable that the more care in selection the less difficult the training.

Equipment Maintenance

Shop and Underground Repairs Are Important as Well as Lubrication And Daily Inspection If Machine Breakdowns are to be Avoided During the Shift

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WILLIAM BURNETT

Electrical Engineer
Peabody Coal Co.

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MOST men who are responsible for the operation of machinery —like other lines of endeavor—look to organization. This certainly ranks high in the essential requirements and must be regimented to work as a whole. The head of a maintenance crew has to show ability, in order to inspire his men. He should surround himself with key men specializing in different types of repair work. As an example, for an underground head man, we know that the successful chiefs have men who excel in locomotive repair, others in mining machines, loading machines, power generation, etc. If you break this down, thinking over the various divisions of work below, you will find seven or eight major assignments.

Years ago, with only locomotives and mining machines to be maintained below, and hoisting engines, shaker screens, and picking tables on the surface, the head of the organization could easily know the details and requirements for all repairs. The story today is vastly different. Without reviewing, we all know that complicated, important, and exacting repairs are necessary because of mine mechanization both top and bottom. No one person can be expected to know all the answers or ways and means of bringing about continuous operation. The tendency is to pick out men as specialists.

Improving the ability of maintenance men and determining how they should and could be trained, brings up the possibility of a central shop for a system of mines. Of course, the central shop again presents a problem of transportation of equipment back and forth to the mines. However, the present trend, after many years of argument, is to send certain repairs—either electrical or mechanical—to foreign, outside shops, in order to obtain a better, more workmanlike job than can be done at the mines, even though the mine top shop is above the average.

Years ago the bottom problems and top problems were connected only by the hoist shaft. That, however, is not true today. The top foreman and his organization have been called

upon to assist in major repair jobs and rebuilding programs. We follow the old setup. Our shops on top as a rule are superior to those below; therefore, when doing a major job, we pick out the place most likely to get it done—together with the advantage of better tools, and, as a bottom man would explain, it gives them a better chance to "holler" about when and why the job is unfinished.

A central repair shop is concentrated power. It is the ideal arrangement, usually with more and better equipment and better working conditions, and is essential in overhauling modern precision machinery. It leads to specialized workmen, with a consequent saving of man-hours.

Under the ways and means subdivision of this maintenance subject, besides suitable small tools, there is a need for larger tools such as adequate main shop and auxiliary repair spots in the mine, which enable the repair men to have the facilities of crane hoisting, machine tools, etc. In the past because a great portion of our workman's energy had been expended in physical lifting or continuous muscular effort, by the time he was ready to get at the heart of the trouble, he was exhausted and required rest.

It is recognized that a man working underground, regardless of facilities, is at a disadvantage as compared to working on the surface. Therefore, the underground man should be a fitter or connector of assembled units only, the detail repair of the assembled units to be taken to a mechanic or skilled machinist who has the time and understanding of a nice job.

Men on rebuilding of machinery, etc., should not be disturbed for normal repair work. There is too much time lost in jumping from one job to another. This other work could be done by someone less competent than the one required for the rebuilding program. Jumping around from one job to another often gets men aggravated, especially those who are really interested and want to do something to make a showing.

The use of labor-saving tools is all well and good if used by the right men, but they are a waste of time and money if used by men who are awkward and who have only one way of doing a thing, and that the old way. Labor-saving tools as a rule fit only into production jobs and are not of much benefit to a maintenance man whose jobs are ever changing.

The third part of this discussion is the determination or desires of the management on how near perfection they wish the equipment to be held. This of course brings in a money problem. As was once said, anyone can keep a thing going if he is furnished with new parts at all times; but a maintenance man who can use the old parts to the maximum condition of wear, and keep the machines running, is the one in demand.

Fear by the underlings of criticism, because of the mandatory attitude of the heads, that equipment must operate at 100 per cent perfection, has caused overstocked supply rooms, with slow turnover of material. If the problem is to be solved by the purchasing or stocking of new repair parts, then the supply room becomes all important. Because of the wide variety of machines—cutting, loading, haulage, etc., with numerous types of the same machine, the stock room becomes a sizable operation at any property. However, this supply should not be the first line of defense.

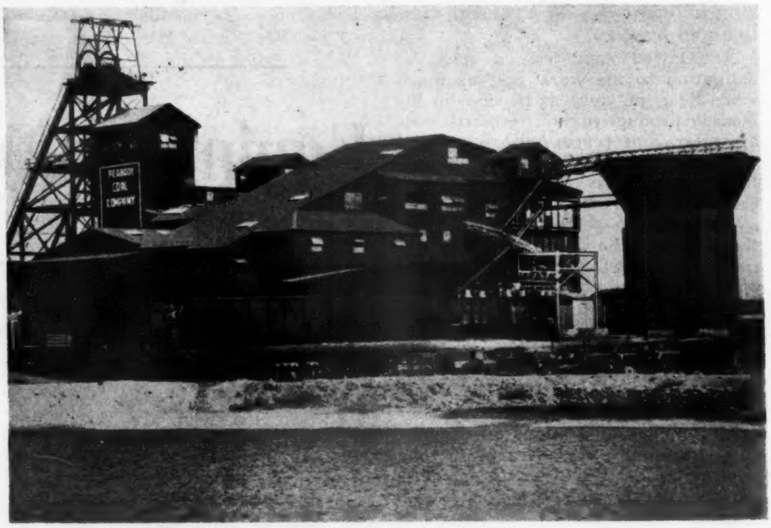
If the problem is to be solved by the ability of mankind and mechanized repair, then a suitably equipped shop on top should be provided. It will of course be necessary to refer to the stock room, as it cannot be eliminated if we are to carry on work in the shop; and it is for this reason that the main shop should be on top if the supply room is on top—otherwise, the supply room should go below if the shop is below.

It so happens that at mines with washing and preparation plants, all the work is not below, as in the past, and as the bottom crew thinks. It would be unreasonable to maintain two fully equipped shops—one on top and one below. If the main shop were below, then certain repair work would have to be sent from top to bottom. This could be done, but the extraordinary cost of building a large shop below and the fact that over 33 per cent of the work is now top work, causes me to recommend that the shop be on the surface.

To conclude the subject of maintenance men, I believe that their work should be divided as follows: the installer of units, requiring little mechanical ability; and the assembler of parts to make up units, which requires the maximum mechanical ability and expert experience. Certainly the maintenance man should not be required to use rebuilt, repaired, or reconditioned parts if this procedure has reached a point where the part should be junked and new parts used.

Lubrication years ago was a never-ending vigil. Each and every bearing or frictional contact requires either oil or a grease. Grease is, and has been, the lazy man's method of lubrication. Grease only increases the time delay in supplying additional lubrication. From my past experience on lubrication, do not ever attempt to install system lubricating from one central point. The so-called "greaser" is one of your best inspectors. Lay out a route for him, time his visits to certain points, and he is one of your most useful employes.

Manufacturers certainly play a most important part in a discussion on maintenance. They can be very helpful by furnishing books of instructions pertaining to the operation of the machine, the making of repairs, performing tear-downs, putting assemblies together, and giving methods and points to watch for in order to obtain a finished job. As an assistance to mine maintenance men, most of the manufacturers have service men frequently visiting the mines and giving useful and willing help in solving some of our problems. These service men are held in highest esteem.



A Peabody Coal Company operation

Safety Practices at Union Pacific

Safety Practices As Applied to Various Underground Operations Have Been Successful in Reducing Lost-Time Accidents and Minor Injuries

F. J. PETERNELL
Safety Engineer
Union Pacific Coal Co.

LAUNCHING a safety program entails effort and to keep the program going at top speed, maintaining interest month after month, year after year is no small task. We must plan to make safety work a permanent factor in coal mines, and we must plan to develop a will for safety in the worker. Making places safe and guarding machines does not entirely eliminate accidents; we try to create a desire for safety and when we use the best safety device known—a safe workman—we begin to get results.

At our monthly safety meetings, which are held at the six districts, cash awards of $40 are awarded to each mine which has completed the month without a lost-time accident. If the mine has worked two consecutive months without a lost-time accident, a suit of clothes is given as an additional award. During the war years, U. S. War Bonds were given as prizes at the semi-annual safety meetings; the principal award being a $1,000 War Bond. The drawing is participated in by those who have worked through the six months' period without sustaining a lost-time accident.

The company is resolved that nothing will be overlooked in its planning that will contribute to the maximum of safety in its operation and to the welfare of its employes and a review of some of the items that have been of cumulative benefit in making safety results possible may be enumerated briefly.

A systematic method of timbering has been adopted for each particular coal bed and strictly adhered to. This system is certainly more desirable than allowing employes, regardless of their capability to decide when and how much timber should be used.

Installation of modern mine fans of high volumetric capacity in conjunction with air shafts and air courses of large sectional areas with frequent overcasts provide an adequate number of splits of fresh air and is responsible for increased safety and health.

Water from storage tanks on the surface is piped to all operating places. Cutting without the use of water on the cutter bar is strictly forbidden, and violation of this rule will subject the offending employe to discharge. Sprinkling also wets down the loose coal as it is mechanically loaded at the working faces.

Adequate clearance, proper alignment and ballasting of the track, blocking all switches, derail latches near main slope haulage and good illumination all tend to provide safe haulage conditions. A well planned rockdusting system, with rockdust provided in sufficient quantities on haulage ways, main intake and return air courses, is done systematically and rockdust samples are collected and analyzed annually. The wearing of hard hats, hard-toed shoes and goggles is compulsory and snug-fitting clothing is also exacted. Regular inspection of machinery installation and operation has been helpful in reducing accidents. In order to standardize production and safety practice, a "Code of Standards" is issued in loose-leaf form, setting forth certain standards for all electrical installations, rockdusting, timbering and various other practices. Copies are given to members of the operating staff, Engineering and Safety Departments.

A carefully planned method of handling explosives is rigidly enforced. The surface storage magazines, for both powder and detonators, are well constructed concrete structures, remote from dwellings or other buildings. The powder is transported into the mine during the off shift in insulated cars. Detonators are carried into the mine by employes designated for that purpose and distributed to locked boxes located near each working unit. The powder is distributed similarly to locked boxes. The unit foreman is responsible for the handling of the explosives and must keep an accurate record to assure himself that no pilfering of powder occurs.

The general cleanup demands of safety work is true economy and sound safety practice. Where the supervisors keep an orderly and well-equipped place, it does not require them to increase the cost in order to obtain better safety results. Good ventilation, haulage, drainage, timbering, clean orderly manways, tools properly hung or stood against the rib, materials properly piled, all tend to contribute to better safety.

It is the definite object of The Union Pacific Coal Company to keep all employes trained in first aid. The company has its own first aid instructors to train all employes. Every person is required to pass an examination given by the Bureau of Mines. After successful completion of the course, he is given a Bureau of Mines and a company certificate. First aid training is fundamental in safety work. It is one of the things that encourages thinking safety outside, as well as inside of the mine.

The company maintains two central mine rescue stations where the mines can be reached in 30 minutes by automobile in case of emergency. The Safety Engineer is in charge of training and instruction in mine rescue, care, use and upkeep of the apparatus and regular classes are held for each of the mines. Regular examinations of the classes and apparatus are made by a representative of the United States Bureau of Mines. Personal instructions on safety are given to the individual men at the working places by the unit foremen and other men of authority who make regular visits at the working places. Weekly staff meetings are held, and all supervisors are required to attend. Safety is freely discussed, and suggestions are welcomed and encouraged. Sound motion pictures on safety and educational subjects are shown at monthly safety meetings, and a lecture by a guest speaker or an official staff member is arranged.

The respective working places are visited several times each day by the mine superintendent, mine foreman, unit foreman and other men of authority. Since safety must be given first consideration, the men are taught to maintain a safe working place. An unsafe practice noticed is corrected before the inspectors leave such places.

Our company has had an established safety program for about 20 years. In spite of temporary setbacks, notable progress has been made in reducing accidents and a worthwhile contribution has been made to the safety, health and general welfare of our employes.

Strip Mining Two Seams

Two Coal Seams May Be Recovered in One Open Pit Operation. Special Use of Equipment For Removing Overburden and Coal Loading Present An Interesting Problem

★

R. PAUL MAUGER
President
Mauger Construction Co.

and

CLAYTON BALL
Construction Engineer
Paul Weir & Co.

★

THE rapid increase in number and volume of both strip and underground coal mine operations in western Kentucky during the past several years may be at least partly attributed to the inherently high quality of No. 11 seam. Averaging from 6 to 6½ ft. in thickness, this seam, when washed, makes a highly satisfactory domestic, commercial and stoker fuel, comparing favorably with other high grade coals produced in the Middle West.

Recovery of this seam by stripping, however, is distinguished from most conventional stripping operations by the unique necessity of handling the No. 12 seam which overlies No. 11 with an interval of only a few feet. Averaging about 4½ ft. in thickness, this seam is completely dissimilar in quality to No. 11, containing a high percentage of inherent ash and differing markedly in combustion characteristics. While future tests may indicate possibilities of blending the two coals for marketing, the present procedure is to pass them separately through the washer without mixing.

The interval between the two coals consists of shale, limestone and underclay. In places the No. 11 seam is directly overlain by limestone, but normally there are from 2 to 12 in. of dark shale between the coal and the limestone. This limestone averages about 4 ft. in thickness, but varies from 1 to 6 ft. It is called the Providence formation and is hard and massive in structure. Underclay of coal No. 12 rests on the limestone and is from 12 to 18 in. in thickness. The total interval averages between 5 and 6 ft.

Mine Operation

The Mauger Construction Company operates two strip mines in the No. 11 and No. 12 seams. The first operation, designated as Pond River Collieries, was started in 1943 and is located in eastern Hopkins County, about 6 miles southeast of Madisonville. The second operation, Pau Mau Coal Company, was started in 1945 and is located in western Muhlenberg County, about 11 miles southeast of Madisonville. Proved coal reserves at the two locations approximate 37 million tons. Both operations are equipped with modern washeries and have a combined productive capacity of approximately 6,500 tons per day.

The overburden of No. 12 coal consists of sandy shale containing sandstone lenses of irregular thickness and extent. Where this material exceeds 25 ft. in thickness the overburden is blasted with 40 per cent gelatine dynamite. Sidewall drills are used to drill 5½-in. holes on 18 to 20-ft. centers located from 18 to 24 in. above the No. 12 coal. The depth of the holes varies from 60 to 80 ft. Under heavier cover, vertical augur holes are also drilled at a distance of approximately 100 ft. from the highwall to improve preparation of the overburden for stripping.

Diesel-powered walking draglines are used to strip the overburden to the top of the No. 12 coal. At Pond River a 7-cu.-yd. unit is in use. Two 6-cu.-yd. units are employed at Pau Mau. An auxiliary diesel engine has been mounted on top of the original cab of each of these three units to

drive a generator for electric power to operate the swing motions. This modification has materially increased the power available for the hoist and drag operations. Under normal conditions the draglines operate on a bench formed by stripping off the upper 20 per cent of the overburden ahead of the units. Pits are maintained at widths of from 80 to 110 ft.

The No. 12 coal is hard and compact and must be broken before loading. Vertical holes on 10-ft. centers are drilled by pneumatic drills and the coal is shot with 60 per cent powder. The coal is loaded out the full width of the pit by a small shovel equipped with a 2-cu.-yd. dipper. When No. 11 coal is being loaded elsewhere this unit is employed to build haulage roads outside the pits. With ample drainage into the preceding cut, the underclay of coal No. 12 is normally sufficiently dry to permit truck haulage to and from the loading unit.

Loading of the upper coal is followed by removal of the material between the two coals. It has been found that the No. 12 coal underclay is spongy and resistant to pneumatic drilling so that it must be removed before the underlying limestone can be blasted. Where the underclay is 1 ft. or less in thickness at Pau Mau and a small utility dragline equipped with a 2½-cu.-yd. bucket is employed for its removal.

The equipment and methods of breaking and spoiling the limestone have been a matter of considerable thought and experimenting by the operating personnel. After getting into full production, two wagon-type air drifters mounted on radial arms attached to the front of a large tractor were first adopted. A 315-cu.-ft. air compressor was mounted behind the driller's seat. With this unit four holes could be drilled at each move of the tractor. The crew consisted of two drillers and a driver.

After further consideration and testing, a new unit was designed and constructed by the company and has been obtaining increased drilling footage and improved operating economy. This unit consists of the stripped chassis of a 10-ton tandem-drive truck on which is mounted a 465-cu.-ft. air compressor connected by eight V-belts to a 100-hp. 440-volt, 3-phase motor also mounted on the chassis. The unit is driven by a 40-hp. variable speed electric motor connected to the truck transmission.

Two air drifters with No. 4 hammers are mounted at the rear end of the chassis on a cross-bar along which they may be moved laterally to between 4 and 8 ft. apart. Normally they are operated on 6-ft. centers. The steering wheel, drive controller and emergency hand brake are mounted on the rear end where they are readily accessible to either one of the two drillers.

The limestone and underlying shale in which the drill holes are bottomed are removed from the No. 11 coal by an electric stripping shovel equipped with a 48-ft. boom, 34-ft. dipper stick and 3-cu.-yd. rock-type dipper. This unit is mounted on 48-in. by 22½-ft. caterpillar treads. The cab is air-conditioned and operating units are furnished with magnetic controls.

Removal of Limestone

The actual procedure of removing the limestone and loading out the underlying No. 11 coal across the full width of the pit is divided into two successive operations. The first step is the removal of limestone from the outer 50 ft. of the pit. This rock is spoiled against the dragline spoil pile in the preceding cut, an operation performed very satisfactorily by the stripping shovel which has a dumping radius of 55 ft. and a maximum dumping height of 37 ft.

The second step is the removal of limestone from the inside 50 ft. of the pit into the space provided by loading the outside 30 ft. of coal. During this process a rock roadway for the trucks is built up and leveled by the stripping shovel just outside the 70 ft. of coal remaining in the pit. This coal is then loaded out to complete the sequence. The coal is removed clear to the highwall in order to leave ample space for the spoiling of overburden and limestone in the succeeding cut.

Fuel oil, gasoline and grease are distributed periodically to the field equipment by special service trucks equipped with racks, tanks and meters.

In conclusion, the stripping of two dissimilar seams separated by a hard, massive formation in one operation is a complex process.

We believe that the utmost attention to adequate supply and efficient distribution of power, to maintenance of roads and equipment and to close adherence to carefully engineered layout and sequence of operation is vital to the satisfactory stripping of our properties.

The Large Dragline in Coal Stripping

Types of Machines And Methods of Operation Forecast Larger Stripping Equipment and Greater Depths of Overburden Removal

R. M. DICKEY
Sales Engineer
Bucyrus-Erie Company

THE dragline excavator derives its digging ability from the weight of the dragline bucket and the application of drag pull to this bucket through the drag rope assembly. They are fundamentally designed to dig below their bases, with the hoist assembly only slightly involved in the digging. Under this condition and because of the non-rigid attachment of the bucket to the machine, dragline booms are ordinarily not subject to the high compressive stresses exerted upon shovel booms, and can be much more lightly built.

Types of Power. The smallest size classification of the large dragline group have long been available with both Diesel and electric power. Both types have Ward-Leonard electric swing, power for this in the Diesel machine being furnished by a direct-current generator belt-driven from the Diesel engine. With the demand for progressively larger units, the manufacturers encountered major difficulties in attempting designs employing brakes and clutches on the hoist and drag drums. Such friction devices on a 25 cu. yd. machine would be of undesirably large dimensions, and would involve major maintenance problems. The designers turned to hoist and drag motions powered independently by direct-current motors and operated by Ward-Leonard controls. Very satisfactory results have been obtained. Not only have operating brakes and clutches been eliminated, but, through advances in motor design, hoist and drag speeds and power have been obtained which are very gratifying. Coupled with advances in motor and generator designs have been improvements in the control system. Most of the customary magnetic contractors have been replaced by devices which may be classed as rotating controls. These have led to faster response of the motors, more accurate control of motor speeds, and major reductions in "over-shooting" caused by lags in inducing opposing flux in field coil cores

An Indiana dragline operation

upon reversal of direction of motor currents.

Methods of using large draglines in coal stripping are relatively few in number. Small units are employed in a much greater variety of ways to which the large machines are not adapted because of their greater size. The method of operation usually in Middle Western bituminous coal stripping places the machine on a bench formed by removal of a certain part of the soft overburden ahead of itself by the dragline. The bench is required for two reasons—in areas of irregular topography to provide a level surface for the tub, or by removing the soft surface material to reach a firmer footing for the machine. After the bench has been established, the dragline is located in a position from which it can make the "key" or "trench" cut which establishes the highwall face. This cut is usually not wider than two bucket widths, and, being narrow, in making it the bucket is held against the highwall face.

This is the simplest type of coal stripping operation in which the single unit is used. More complex methods have been devised to obtain greater stripping range without increasing the boom length or decreasing the bucket size. These usually require that the machine handle at least part of the spoil in two stages —the machine is standing part of the time on previously-deposited spoil, and this spoil is later rehandled.

In the Pennsylvania anthracite districts large draglines are commonly used singly, having to some extent replaced the close-coupled shovel and truck-haulage type of operation and does whatever primary excavation and spoil-rehandling is necessary to uncover the anthracite.

This fashion is widespread in the Middle West. With booms up to 175 ft. long and buckets as large as 20 cu. yds., they operate from the coal surface with the boom at a large angle with the horizontal; they follow the stripping shovel in physical position and precede it in mining sequence by benching off the higher part of the overburden, leaving the lower part for removal by the shovel on the succeeding stripping cut. From the standpoint of direct operating cost, this method is perhaps the least efficient of all those employing draglines. The machine is digging well above itself, in a position to which it is not well-adapted. The introduction of another large unit in the pit increases pit congestion undesirably and leads to reduced haulage efficiency.

Both caterpillar-mounted and walking draglines are used in this way, but the walking machines have been far more successful in obtaining satisfactory costs, because of their maneuverability and their relatively low bearing pressures which enable them to function successfully on soft footing. The long boom with an operating radius of as much as 215 ft., as employed up to the present time, precedes the stripping shovel both physically and in the mining sequence. It stands on the bench directly ahead of the shovel and takes a bench cut at least a cut ahead of the shovel, spoiling this material on the last-deposited shovel spoil pile directly opposite it. The main disadvantages of this operating method are the reduction in digging efficiency which invariably accompanies benching work; the necessity of surfacing the bench with shale or similar material taken from the bank and spread over the bench surface to provide a roadway, which material must eventually be rehandled; and the increase in operating costs brought about by using two stripping units on a job instead of one.

In this type of work, both walking machines operate from the bench. One takes the bench cut and the other the balance of the overburden. The benching machine requires a longer operating radius than the one working in the face. For two units of equivalent basic capacity, the face machine can have a shorter boom and larger bucket than the bench machine, and the respective amounts of overburden handled by each are adjusted accordingly.

This type of work is usually done by walking machines with buckets of from 5 to 7 yds., but in at least one case a 10 cu. yd. machine has been so used. The method is simple — the dragline is located on the spoil, and makes spoil room for the next dipper load from the stripping shovel by pulling back the dipper load last dumped. This operation would seem to have its best application in areas where the overburden fluctuates considerably in thickness. The dragline can be called upon to aid the shovel when the overburden is so deep that the shovel can no longer easily dispose of its spoil. The chief disadvantage of the method is the added cost of rehandling the shovel spoil. In this respect the machine is unproductive. However, its importance lies in enabling the shovel to operate at lower cost, or even to strip to depths which it could not otherwise do.

Draglines for high casting

Rubber in Open Pit Mining

Trends in Use of Rubber in Open Pit Mining Equipment Are Discussed With Both Advantages and Limitations Indicated

J. G. BERRY
Field Engineer
Tire Engineering Dept.
United States Rubber Co.

THERE is no phase of open pit mining that does not utilize rubber in some form. Today 75 per cent of your operations of uncovering or transporting coal are performed by rubber tire equipped vehicles. Supplemental usage of belts and crawler type equipment introduces other uses for rubber.

In transporting materials over a wide range of operating conditions, the truck has proven to be the most flexible piece of equipment, but the flexibility of the unit has been a function of its size. We have seen the truck develop very quickly through the 20-yd. capacity vehicle, but development from there has been very slow. The factors of length of haul, speed, rate of lift have all had a part of retarding the development of these vehicles and those factors are part and parcel of the trend of your operations. Trucks and roads go hand in hand. Road building is expensive. Maintenance of roads is expensive. Grades on roads must be moderate. Under these conditions the small or medium truck has proven most efficient in collecting coal at a major loading point and grades of 10 per cent and hauls of up to three miles have been considered feasible and profitable.

The belt method of material hauling has the advantage that a very high rate of lift can be obtained, in some cases as high as 30 per cent. It has the further advantage that the cost of handling per ton-foot or ton-hour is very low and in many instances is reported as low as 15 to 20 per cent of that of truck handling costs. Under existing conditions it has the disadvantages of very low flexibility in that distances between centers are relatively low, range of loading and unloading is limited to a small area and initial costs are high.

Crawler type equipment has the advantage of being able to negotiate severe conditions of terrain without expense of road building, but unfortunately to date the speeds at which this equipment is designed to operate are relatively low and the carrying capacity of material-hauling vehicles now in use is also low.

It is evident from the foregoing that no one type of material-handling equipment is fully suitable for all types of operations. We can expect to see a combination of the three types in any extensive operation; crawler equipment and rooter-scraper trains in removing overburden; small trucks and moderate trucks for collecting to some sub-disposal point; transmission by belt to a secondary disposal point; and finally, large trucks for transmission to a final disposal point.

Development of tire usage for military operations has taught the rubber industry many things about operation of rubber tire equipped vehicles over adverse terrain conditions. We have learned many new lessons on mobility of vehicles. By mobility we infer not only the flotation to keep a vehicle on top of the working medium, but also the establishment of sufficient tractive effort to negotiate the terrain. We know therefore that certain ratios between the dimensions of the width and rim diameter of a tire are directly beneficial in securing this mobility. Without becoming too technical, we can say that greater benefit can be secured from increasing section width than can be obtained from increasing rim diameter. If you propose to reduce costs of operation, you certainly can look at the large-size, low-pressure tire as one possible means toward accomplishing a part of that reduction.

The belt method of material handling has proven a low-cost method where the flexibility was not a primary factor. In the operations which we foresee, the lack of flexibility will be offset by multiple installations since you will be forced in many instances to cope with grades in excess of those which are considered feasible with truck haul. The cost of the initial multiple installation will be weighed against the cost of grading and it will be found that in many instances the balance will be in favor of belt installations. Your equipment

Heavy tires for large capacity trucks

manufacturer is cognizant of this fact and is working to develop long-range loaders and unloaders to introduce greater flexibility into this type of material handling. The belt manufacturers have progressed from light-weight duck rubber-covered belts through heavy duck, through rayon fabric to finally wire fabric rubber-covered belts to permit extension of length between centers so that initial installation cost may be reduced.

Crawler type equipment has the advantage of being able to negotiate unimproved terrain and has been generally adaptable to shovels, draglines, bulldozers and such. The use of rubber tracks was developed during the war and it was found that rubber track life was more than double steel track life. In addition, tank speeds were increased up to 55 miles per hour which speeds were impossible to attain with metal tracks. The transition from full track equipment to half-track was a natural move for tactical vehicles and relatively large vehicles up to 10 tons were developed. These vehicles operated in speed range up to 40 miles per hour and were found suitable for both highway and off-road service.

The tire which you use today in open-pit mining is not the same tire which you used before the war; it is a stronger tire insofar as carcass construction is concerned. At the beginning of the war, tires for strip mining were generally made using a heavy cotton cord as a fabric material. Due to the requirements of rubber conservation, rayon fabric was substituted in all truck tires because the rayon carcass synthetic tire operated cooler than the cotton carcass synthetic tire, and many heat-induced failures were thereby minimized or completely eliminated. In tires used for off-the-road service, it was desirable that a greater strength be developed in the carcass to resist the ruptures and fabric breaks caused by operating over rock and rough terrain. As a result, a heavier rayon was used in off-the-road tires than was used in highway tires, and was continued in use after the war ended.

You all probably have seen publicity releases and advertising relative to the use of wire cord in truck tires. Our development experience on tires using this construction is in excess of three years and I can tell you that the wire carcass tires which have been introduced experimentally into strip mining have performed very satisfactorily and it is indicated that they will be a definite part of your future use of rubber in open-pit mining. New investigations are also under way to develop tires suitable to an equal degree for both on and off-the-road operation so that the same tire may be used for high-speed highway operation and low-speed off-the-road operation. The successful end of this investigation will be directly beneficial to you in your future operations because of the nature of the trend of the operations which we pointed out in the early part of this paper.

Loading without blasting the coal

Investigation of the wire fabric belt for transfer of materials was discussed a little earlier in this paper from the standpoint that greater strength could be obtained and therefore greater length belts and wider belts could be provided. The eventual end of this investigation will result in wire being used in all plies of the belt where the greatest strength will result.

Despite our statement that the track would find very limited usage in open-pit mining, we must not forget that development never ceases. Your changing conditions may very readily reveal services in which the track and only the track may be the most economical means of negotiating particular terrains. The rubber track, when used in conjunction with rubber bogies, will provide excellent shock absorption qualities which are not available in steel track and which permit of faster operation. Developments are under way to produce greater grouser action, the lack of which we stated was the one objectionable feature of rubber tracks where their use was required in soft going. When such developments are completed, the position of the future use of the track will very definitely be improved.

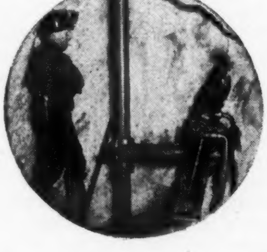
Reclamation and Conservation of Stripped Lands

★ ★ ★

THREE papers were presented at the Convention by Messrs. L. E. Sawyer, James W. Bristow and R. T. Laing, dealing with successful methods of reforesting and revegetating spoil banks as developed in Illinois, Indiana and Pennsylvania. Because of the wide interest in open pit mining, these three papers will be published, complete with illustrations, as a special feature in the July MINING CONGRESS JOURNAL.

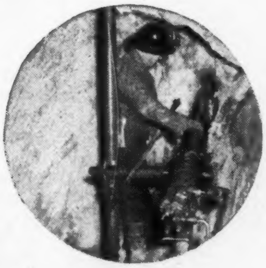
The DRILL does the work
...not the operator
when it's a Gardner-Denver Automatic Feed Drifter

1
Drill runner collars a hole with Gardner-Denver CF89H Automatic Feed Drifting Drill. He selects proper feeding pressure and opens throttle to run down the 2' starter steel.

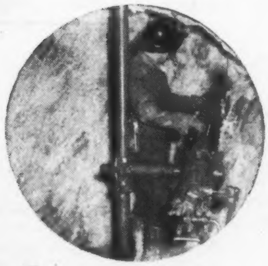


2
Runner lights and smokes a cigarette while the drill continues to run automatically.

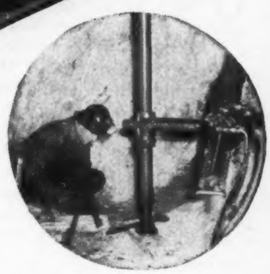
3
Runner picks up the second steel, 4' length, and when starter is run out, throws throttle to blowing position, cleans hole, closes throttle and reverses feed.



4
Runner removes starter steel from drill chuck.



5
Runner inserts second steel in hole and drill chuck.



6
While drilling out the second steel, runner removes the drill bit and puts sharp bit on the starter for the next hole, and places 6' steel in handy position for the next change.

The photographs on this page show why drill runners and mine operators call the Gardner-Denver CF89H the *only* completely automatic drifter on the market.

Smooth-running—free from vibration—the Gardner-Denver CF89H Automatic Feed Drifter can show you something NEW in the way of performance and dependability. For full information, write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER *Since 1859*

The "Have-Not" Theory And Metal Prices

Erroneous Conclusions Have Resulted from Incomplete Analysis of the Relationship Between Metal Prices and the Incentive for New Mine Development and Exploration

★
By IRA B. JORALEMON
Consulting Mining Engineer
San Francisco, Calif.
★

ONE of the commonest faults of logic is the non sequitur. This may be defined as an attempt to cross a river by a bridge that isn't there. The U. S. Bureau of Mines statisticians and the other Washington officials who have been spreading the belief that the mining industry in the United States is dying have apparently never heard of the non sequitur. They start with a premise that is partly true and jump to a conclusion that follows only in their wishful thinking.

These pessimists are to a large extent right in saying that the enormous consumption of the war years has depleted the known reserves of ores of the principal metals. They jump from this premise to the conclusion that domestic consumption will continue to greatly exceed the rate of finding new orebodies, and that we must rely to a constantly greater extent on foreign ores for our metal supply. As a corollary to this thesis, they maintain that the search for ores in the United States will no longer attract private capital, and that future exploration must be carried on chiefly by the Bureau of Mines, guided to some extent by the U. S. Geological Survey.

Such conclusions would be justified only if there is no explanation for the present comparatively small ore reserves that is more reasonable than the impossibility of finding great new orebodies. Fortunately another explanation seems much more plausible. An analysis of metal prices shows an unmistakable relation between fluctuations in the value of ore and the rate of finding ore. This relation holds outside the United States as well as within this country. Metal prices made it inevitable that little exploration would be done, and little ore found in a period of depressed prices like that from 1930 to 1941. Of course almost no development could be carried on during the war. Altogether 15 years have passed since any serious attempts have been made to find ore. In many of these years consumption has been abnormally high. Naturally ore reserves have been depleted. This would have been true regardless of the amount of ore that remains to be found. Until it is shown that ore can no longer be developed when the price structure is favorable, the "have-not" theory is left hanging in the air, with no logical support.

AVERAGE METAL PRICES

Metal	1901 to 1915 New York c per lb.	1901 to 1915 London £ lng. ton	1916 to 1930 New York c per lb.	1916 to 1930 London £ lng. ton	1931 to 1941 New York c per lb.	1931 to 1941 London £ lng. ton
Copper	14.8	65.8	17.0	78.3	9.5	37.9
Lead	4.5	15.4	7.0	28.1	4.6	14.7
Zinc	5.9	25.7	7.0	37.0	4.5	15.0
Index of Wholesale Prices	100		150		110	

The accompanying chart shows average prices of copper, lead and zinc in three periods between 1901 and 1941. These three metals are the ones in which the calamity howlers consider the shortage of domestic supply to be most serious. The table shows that London metal prices have moved in the same cycle as domestic prices, but that relative fluctuations abroad have been even greater. The story of ore discoveries at home and abroad follows the same pattern in the different price periods.

The Bonanza Period of Copper

In the case of copper, the period from 1900 to 1915 was most favorable for domestic mines from the point of view of price and costs. The copper price averaged 14.8 cents per pound, and wages and costs of supplies were comparatively low. The effect on copper discoveries of this prosperous period was spectacular. An intensive search for new mines and for more economical methods of treating low grade ores resulted in the greatest additions to copper reserves and to the list of new great producers in the history of the country. The list of mines that came to production, or that multiplied a small earlier production, in these 15 years includes most of the great copper mines in the country. Utah Copper, Nevada Consolidated, Chino, Ray, Inspiration, Miami, Calumet and Arizona, Kennecott, New Cornelia, United Verde Extension, North Butte, Shattuck Denn, Mammoth and Magma entered the list of great copper mines in this period, while the older mines in Butte, Bisbee, Morenci and Jerome found great new orebodies that enormously increased reserves.

Conditions were nearly as favorable outside the United States in these bonanza copper years of 1901 to 1915. Exploration was slower in getting under way, but once started, was no less fruitful. Financed largely by copper interests or companies in the United States, the foreign copper mines that were found or brought to major size in these 15 years included Chile Copper, Braden, Andes, Katanga, Cananea, Cerro de Pasco, Nacozari, Brittania and Granby. The copper mines developed between 1901 and 1915, in and out of the United States, have furnished far more than half of all

the copper produced in the world in the ensuing thirty years.

From 1918 to 1930 the average price of copper in the United States averaged 17 cents per pound which was the highest in half a century. Even omitting the war years of 1916 to 1918, the price averaged 14.9 cents per pound. The high price was not accompanied by the optimism on the part of domestic companies that is necessary for an effective exploration campaign. Costs, as shown by the wholesale commodity index, had advanced more rapidly than the copper price. And the enormous ore reserves and productive capacity developed in the preceding years seemed, to the conservative and prosperous American producers, sufficient for many years to come. It was easier to double ore reserves at the great "disseminated" copper mines by including low grade material that had been made commercial by metallurgical advance, than to go out and find new mines. The venture spirit was gone, and instead of hunting for new deposits, the great American copper companies acquired by purchase or consolidation known properties that would yield a safe, low profit rate. Kennecott acquired Utah Copper, Nevada Consolidated, Ray and Chino, and became the greatest American producer. Phelps-Dodge purchased Arizona Copper Company, with the potentially great Clay orebody, and just after the end of the period formed a consolidation with Calumet and Arizona. Anaconda acquired the greatest of all copper deposits by its purchase of Chile Copper. While only a few comparatively small deposits like Walker were brought to production in the United States in these 15 years, the domestic copper companies added enormously to their ore reserves and strength.

Foreign Copper

In foreign countries, the story of copper was far different between 1916 and 1930. The London price averaged nearly 20 per cent higher than in the preceding 15 years, and costs had advanced very little in most parts of the world. The foreign demand for copper was rapidly increasing. The industry was even more prosperous for British, and other foreign companies, in the years from 1916 to 1930 than in 1901 to 1915. And exploration results were in keeping with the incentive given by this prosperity.

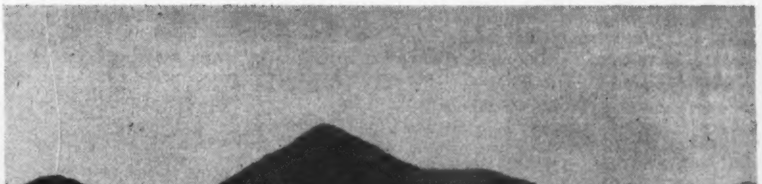
American companies no longer played an important role in foreign exploration. To be sure, Chile, Braden, Cananea and Cerro de Pasco added greatly to their ore reserves. But except for large orebodies found in the island of Cypress by Seeley W. Mudd and associates, neither the American copper companies nor the individuals responsible for the earlier developments found any great new foreign copper mines after 1916. New groups, either entirely foreign or with minor American participation, took the place of domestic companies in a great campaign of venturesome exploration. And they found copper deposits almost as spectacular as those developed at home and abroad in the preceding period.

The great orebodies in Northern Rhodesia, including Roan Antelope, N'Changa, Mufilira, and Rhokana; the almost equally great deposits of Noranda and the Frood Mine of International Nickel, and the less dramatic deposits of Hudson's Bay, Sherritt Gordon, Falkonbridge, Bor, Mt. Lyell, Naltagua, Matahambre and O'Okeip all resulted from the campaign of foreign exploration between 1916 and 1930. Again, a high metal price and favorable economic conditions were accompanied by great discoveries of copper ore.

If these new foreign mines had been found by American copper companies, there would be reason to conclude that exploration in the United States was no longer profitable, and that our companies had to go abroad to find ore. The fact that domestic companies took no part in the development of the new copper districts suggests, at least, that it may have been the will and skill to find new mines at home, and not the opportunity, that was lacking. Due perhaps to the conservatism that comes with age, the American companies had lost the venture spirit that is necessary for successful exploration.

The Depression and Low Copper Prices

The decade from 1931 to the beginning of World War II was one of depression and poverty all over the world. Even the strongest companies had to discontinue or reduce their dividends and deplete their working capital to the danger point. With a minimum annual copper price averaging 5.55 cents in 1932, and an 11-year average of 9.5 cents, large scale exploration for new copper deposits was out of the question. In spite of this the limited amount of development resulted in profitable moderate sized copper mines at Mountain City and Chelan, and in important additions to reserves at Chino, Consolidated Coppermines, the Clay orebody at Morenci, and in other old districts. The foreign copper price suffered an even greater drop, to less than half the average of the pre-depression 15 years. However, the comparatively small amount of foreign development found important copper deposits at



Enormous ore reserves developed in the past have seemed sufficient for years to come

Mt. Morgan, Boliden, Waite Amulet, and two or three fair sized new deposits in Rhodesia and Katanga. At home and abroad developments in the period of low copper price were equally insignificant compared with those in the periods of high prices, but enough mines were found to prove that exploration was still worth while.

The past few years of war and resulting labor shortage have of course made mine exploration almost impossible, except for the limited amount of drilling carried on by the United States Bureau of Mines. This work, aided by the geological deductions of the U. S. Geological Survey, resulted in the discovery of the San Manuel copper deposit in Arizona. This deposit is now being actively developed by Magma Copper Company. While development is incomplete, work completed thus far suggests that the San Manuel may be the greatest copper deposit found in the United States in 30 years or more. The discovery is of note because all save a small corner of the deposit is covered by gravel and conglomerate of later age than the mineralization. This bears out the idea held by many geologists that other important orebodies may be found where outcrops are hidden by gravel or other material that masks the orebearing formation.

To sum up, the history of development of copper mines since 1900 proves that an overwhelming proportion of discoveries, at home and abroad, have come in the periods when the relation between copper prices and costs has been most favorable. When this relation has shown that more copper is needed, an active exploration campaign has found the copper. When a low price, great reserves, and excess productive capacity discouraged exploration, few new deposits were found. This explanation is at least as reasonable as the "have-not" theory, which holds that because there have been few domestic discoveries in the past few years, future discoveries will be equally rare. The same "have-not" reasoning would make the foreign copper industry nearly as far along the road to exhaustion as the domestic industry.

The Story of Lead and Zinc

In the case of lead and zinc, the case is not so clear. Prices followed the same pattern as that of copper, with the fluctuations even greater. Both in New York and in London a fairly low price in 1901 to 1915 was followed by an increase of 19 to nearly 100 per cent in the next 15 years average, and a still more catastrophic drop in the decade of depression that preceded World War II.

The list of new lead and zinc mines that entered the list of major producers in the three periods shows a relation to metal prices much like that of the copper mines. The situation was complicated by the fact that many of the lead-zinc orebodies had been found many years earlier, because of their precious metal content. Major lead and zinc production usually resulted from a combination of metal prices and metallurgical progress, not from entirely new discoveries. In the following paragraphs, the lead-zinc mines are credited to the period in which they came to important production rather than to the date of discovery.

In the 15 years from 1901 to 1915, the New York prices of lead and zinc averaged only 4.5 and 5.9¢ respectively, and metallurgy was inadequate. Only comparatively rich and well located lead or zinc mines had any value. Few large new mines came to production, either in or out of the United States. Mascot, Hecla and Butte and Superior in the United States, and Burma Corporation, the Altai Mountain deposits in Siberia, and the Sullivan Mine in British Columbia, about complete the list.

In the ensuing 15 years from 1916 to 1930, the New York price of both lead and zinc averaged 7¢ per pound, and London prices rose even higher in proportion. Flotation made possible the beneficiation of ores in which lead and zinc minerals were so closely associated that they could not be separated by earlier milling methods. As a result, dozens of mines from which lead and zinc output had been insignificant became great producers. In Idaho the Star, Bunker Hill and Federal properties became important zinc as well as lead producers. In other parts of the United States, the United

Tungsten deposits have beeen found by use of the ultraviolet lamp and older deposits have been extended by new techniques. The Pine Creek plant at Bishop, Calif.

States Smelting, Refining and Mining Company mines at Bingham, Park Utah, the Pend Oreille District in Washington, and half a dozen new deposits in the Tri-State District entered the list of great zinc and lead mines. Abroad the list is even more striking. The Sullivan mine of Consolidated Mining and Smelting Company multiplied its production. Buchans, Base Metals and Hudson Bay, in Canada; Fesnillo, Ahumada, the Potosi and San Francisco mines in Mexico; Mt. Isa, Sulphide Corporation, Zinc Corporation, Electrolytic, Zinc and Broken Hill in Australia; Aguilar and Cerro de Pasco in South America; Trepca and many Belgian, German and Polish mines are only a few of the properties that became major lead or zinc producers in these years. The result was that while a lead famine threatened in 1924, there was great overproductive capacity of both lead and zinc by 1930.

This excess of production, added to the world-wide depression, brought prices of lead and zinc down to hopelessly low figures. In New York, lead averaged 4.6¢ and zinc 4.5¢ per lb. in the years 1931 to 1941, inclusive. In London the price of lead fell from £28.1 to £14.7 per ton, and that of zinc from £37 to £15. Only the fact that many lead-zinc mines have important precious metal by-products enabled the industry to keep alive at these prices. Exploration was at a standstill. No new deposits of importance were found in the United States. In Canada, several moderate sized zinc mines with high gold values were developed. In other parts of the world, aside from additions to zinc reserves at some of the Cerro de Pasco mines, there were almost no discoveries of note. As in the case of copper, low metal prices had effectively ended the period of great ore discoveries in all parts of the world.

During the war years, lead and zinc prices have been much higher, particularly if premiums are included. Manpower shortage has permitted little exploration. Save for large new zinc deposits at Santa Rita and Hanover, N. Mex., there have been no major additions to domestic or foreign lead and zinc reserves. Unless new discoveries come before many years, there will be a serious world shortage of both of these metals. If history is any indication of the future, the much needed new mines will be found. Higher prices will result in new lead and zinc mines in the United States as well as in foreign countries.

Quicksilver and Tungsten

Among the minor metals, quicksilver and tungsten have shown most clearly the effect of metal prices on ore discovery. In 1938, following 30 years in which the price of quicksilver in the United States had averaged \$80 per flask, most of the quicksilver mines in the United States were shut down and ore reserves were negligible. From 1939 to 1943, the price averaged \$171 per flask. In spite of shortage of men due to the war during most of these years, there was an unprecedented search for new quicksilver deposits. The result was the discovery of the largest and richest cinnabar orebodies that had been seen in the United States for many decades. Reserves are probably as great as at any time in the history of the domestic industry. In many of the mines—notably New Idria, Cordero, Reed, Sonoma and Bonanza—the ore was so rich that it would have yielded an excellent profit even in the earlier period of low prices. It had not been found long ago because the low metal price had not made it worth while to hunt for it.

Reserves of quicksilver are as great today as at any time in domestic history. The New Idria mine in California

In tungsten mining the story has been much the same. Before World War II, the domestic price, with wild fluctuations, had averaged about \$14 per unit of tungstic oxide. The few tungsten mines operated, for the most part, on a hand to mouth basis, with pitifully small ore reserves. When the price rose to \$24 for older mines, and \$30 for new producers during most of the war, exploration increased many times over. The ultra-violet ray lamp came into common use just in time to greatly help in the search for scheelite ores. The prospecting campaign resulted in many new mines and in increased reserves at most of the older mines. The great Yellow Pine scheelite deposit in Idaho was found and brought to production just in time to avoid a serious shortage of tungsten during the war. Large orebodies near the Getchell gold mine, the Golconda manganese-tungsten deposit, Nevada-Massachusetts, and many other properties have placed far more known tungsten in reserve than was dreamed of 5 years ago. All that was needed was the incentive to hunt for the ore.

In all save a few unusual metals like tin, the United States and the rest of the world are in the same boat. When the relation of metal prices to costs has made exploration worth while, large orebodies have been found. When prices have been low at home or abroad, discoveries of new ore have been trivial. As far as known reserves are concerned, other countries are more abundantly supplied with lead, zinc, copper and other ores than are the United States. But in proportion to population, we still have more than our share. In possible reserves that remain to be developed, the history of discoveries in the United States is as promising as that in other parts of the world. Everywhere, more ore can be found only if it is worthwhile to look for it.

If the search for ore does not become an attractive speculation, because of low metal prices and high taxes, the United States and the rest of the world as well will soon be in the "have-not" class. Only the possibility of spectacular profits can bring back the venture spirit that gave the United States its spectacular superiority over all the rest of the world in natural resources. Before throwing up the sponge and abandoning the domestic metal industry, why not give the venture spirit another chance?

WHEELS OF GOVERNMENT

As viewed by A. W. DICKINSON of the American Mining Congress

CRUX of the aggravated strike situation was reached late in May when two ill-mannered representatives of railroad unions defied the President at a White House conference. The Nation's Chief Executive acted quickly by addressing a joint session of the Senate and House at 4 p. m., May 25, and called for legislative authority to draft recalcitrant workmen into the Army. Immediately following the President's departure from Capitol Hill, the House approved the legislation and sent it to the Senate. Resumption of operations of the railroads took place the same day; the Government signed a contract with bituminous coal mine workers the following week, and it is indicated that the anthracite mine workers and the maritime union will now fall into line.

Work is going forward in the Congress on the military draft, OPA extension, British loan, the departmental supply bills and other current legislation, and adjournment now seems possible by mid-July.

Coal Production Resumed

The country's bituminous coal mines resumed operations June 3 following announcement by the Government on May 29 that a wage contract had been negotiated. From one-half to two-thirds of the miners worked during the truce period from May 12 to 25, but nearly all of the mines were idle during the week of May 26. The anthracite mines ceased operations May 27 but indications are that a contract will be completed in the near future.

Under the terms of the bituminous contract the miners receive an increase of 18½ cents an hour amounting with overtime to an increase of $1.85 per shift. Mines will operate 9 hours per day, with overtime paid after 7 hours, also for the sixth day if worked, and for holidays.

Five cents a ton on coal produced will go to a welfare and retirement fund managed by a Board of Trustees, one from the UMWA, one appointed by the Coal Mines Administrator and one chosen jointly by these two. Deductions now made or hereafter authorized for doctors' and hospital payments will go to a medical and hospital fund administered by UMWA trustees. Under the terms of the contract a survey of hospitals and medical facilities, medical treatment, sanitary and housing conditions in coal mining areas is now being made by Rear Admiral Joel T. Boone of the Navy Medical Corps. In cases where fines and penalties are imposed for violation of contracts the money shall be paid into the medical and hospital fund.

A Federal Mine Safety Code to be developed by the U. S. Bureau of Mines is to be policed by the Bureau's inspectors, and there is to be a Mine Safety Committee in each mine composed of mine workers, to report violations of the code. This committee has power to stop operation of the mine if it believes an immediate danger exists. The Coal Mines Administrator will direct operating managers to comply with state workmen's compensation and occupational disease laws, whether elective or compulsory. Mine workers are to receive $100 for ten days' vacation pay in place of the previous payment of $75.

The contract was quickly approved by the National Wage Stabilization Board. Coal operators have been meeting with OPA officials on the question of price increases, with forecasts from Government sources varying from 25 cents to 35 cents a ton.

Case Bill

On the White House desk with the axe of a veto poised above it, the Case bill, H. R. 4908, has been the center of violent controversy. A prolonged filibuster by obstructionist Senators was finally broken May 23 by approval of the Byrd (Dem., Va.) amendment, outlawing the exaction of royalties on production by labor unions but permitting employers to pay into health and welfare funds as trust funds jointly administered. Two days later the Ball (Rep., Minn.) amendments were accepted (1) requiring employers and employes to bargain collectively by stating their demands and practicing sound collective bargaining; (2) providing a 60-day cooling-off period in cases where the Federal Mediation Board intervenes; (3) calling for fact-finding in disputes threatening stoppages of public utilities; (4) making unions sueable for violation of contract; (5) denying protection of Wagner Act to employes participating in wildcat strikes; (6) outlawing secondary boycotts in restraint of commerce; (7) outlawing violence through other coercive union tactics (boycotts) in interfering with an employer's operations or in jurisdictional controversies; and (8) removing supervisory employes from the coverage of the Wagner Act.

On May 29 the House, which had previously passed essentially the same bill, voted 230 to 106 to concur in the amendments of the Senate and the bill was sent to the President. If

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Washington Highlights

CONGRESS: In turmoil over labor bills.

COAL: Mines resume as Government forces wage contract.

CASE BILL: On President's desk.

STRIKE LEGISLATION: President's bill delayed in House.

OPA: McFarland amendment accepted.

STOCKPILING: Conferees report S. 752.

TRADE AGREEMENTS: Put off until after November elections.

GWYNNE BILL: On Senate calendar for early action.

POLLUTION: Mansfield bill reported in House.

SILVER: Murdock bill on Senate calendar sets 90.3c price.

ATOMIC ENERGY: Senate approves McMahon measure.

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a veto follows, the Congress may attach the substance of the Case bill to the President's strike control bill (see below), but the rumor is current that if this is done the President will veto his own bill.

President's Strike Bill

Driven on by the current strike crises the President on May 25 called upon a joint session of the Senate and House for a strike control bill. The measure was immediately introduced, approved by the House 306 to 13, and sent to the Senate. As passed by the House the measure would authorize imprisonment and fines for failure to terminate work stoppages or slowdowns upon order of the President, after the Government had taken over a strike-bound industry. The President could then fix "fair and just wages and other terms and conditions of employment." He could also draft into the Army employes refusing to return to work and such workers would also lose their seniority status and their rights under the Wagner Act or the Railway Labor Act. A company placed under Government operation would have its net profits retained by the Government. Violators of the Act would be subject to the issuance of Federal injunctions without reference to the Norris-La-Guardia Act. Designed as a temporary measure the authority granted would end June 30, 1947, or six months after the cessation of hostilities, whichever is the earlier.

The Senate struck out the military draft section of the bill, the loss of seniority rights by strikers and the taking over of a company's net profits by the Treasury while under Government control.

Further House action on the Senate amendments is expected to be deferred until the White House acts on the Case bill.

OPA-McFarland Amendment

The Senate Committee on Banking and Currency has reported the OPA extension bill, in which is included authority for the expenditure of $100 million for premium price payments for the year beginning July 1, 1946; the Premium Price Plan is to be extended on a noncancellable basis for another 12-month period. The McFarland (Dem., Ariz.) amendment, discussed last month, was included but with omission of the section increasing the ceiling prices of copper, lead and zinc, by shifting 60 per cent of the initial subsidy on each metal into the price. As adopted by the committee the amendment reads:

"Provided further, That (A) payments of premiums, or purchases of copper, lead, and zinc or ores of copper, lead, or zinc, may be made after June 30, 1946, in such amounts as may be necessary to fulfill obligations incurred prior to July 1, 1946, with respect to 1946 and prior fiscal-year activities; and that (B) premiums shall be paid on ores mined or removed from mine dumps or tailing piles before July 1, 1947, though shipped and/or processed and marketed subsequently thereto; and that (C) the premium price plan for copper, lead, and zinc shall be extended until June 30, 1947, on terms no less favorable to the producer than heretofore and (1) adjustments shall be made to encourage exploration and development work, (2) adequate allowance shall be made for depreciation and depletion, (3) all classes of premiums shall be non-cancellable unless necessary in order to make individual adjustments of income to specific mines."

Meanwhile, effective June 3, OPA has announced a price of 14⅜ cents a pound for copper, and a price of 8.25 cents a pound for lead. These increases are the result of conferences in which Senator McFarland, other Western Senators and OPA officials participated.

Another outstanding amendment placed in the OPA extension bill by Senator Fulbright (Dem., Ark.), provides that the pricing powers cannot be used to compel changes in business cost practices, and restores to dealers the discounts prevailing in business transactions prior to 1942.

Stockpiling

Senate and House conferees on June 5 reported the Thomas-May Strategic and Critical Materials Stockpiling Act, S. 752. The measure had been passed by the House May 24 in the same form as reported by its Military Affairs Committee and discussed in our April issue.

In the conferees' report the House version of S. 752 largely prevails, although the specific limitation of funds for procurement and handling of strategic and critical materials is replaced by the more open treatment of the Senate bill. The establishment of a revolving fund from proceeds of sales of materials, as carried in the House bill, is eliminated. The Senate proviso that materials purchased from foreign sources be admitted into the United States free of any tariff duty, import tax, or other impost, is restored; this has reference only to materials purchased for stockpiling and the duty is to be added in case of subsequent sale of the material.

Foreign Trade Agreements

Postponement of the United Nations Economic and Social Council meeting to October places the negotiation of foreign trade agreements with 14 nations still farther in the future. Plans now call for an interval of several months between the United Nations Council meeting and the trade agreements conference. It is reported that tariff reduction discussions are not to take place until some time after the fall election. Publication of a list of commodities subject to negotiations for reduction in duty will probably precede these discussions by three months.

Gwynne Bill

Reported by the Senate Committee on the Judiciary May 27, following House passage May 20, the Gwynne bill, H. R. 2788, may receive Senate approval and go to the White House at any time. As this important measure passed the House its limitation on suits for back pay and "liquidated damages" under the Fair Labor Standards Act was increased from one to two years.

Stream Pollution

The Mansfield water pollution bill, H. R. 6024, reported by the House Committee on Rivers and Harbors April 13 and discussed in last month's issue, has now been granted an open rule for floor consideration. In the legislative logjam that is now developing this measure may not be taken up by the House but if it is placed on the Majority Leader's program it is expected that the milder Spence bill, which contains none of the dangerous Mundt features, will be offered on the floor as a substitute. It will be remembered that H. R. 6024 contains in modified form the principle of Federal control and policing of the local problems of stream pollution, which for years has been vigorously resisted by the mining industry.

Silver Sales

On May 20 the Committee on Banking and Currency reported the Murdock (Dem., Utah) bill which contains the provisions of the "Hayden amendment"—the agreement reached in the Senate Appropriations Subcommittee—authorizing an immediate sale and purchase price of 90.3 cents per ounce for silver, increasing to $1.29 after two years. The Murdock bill was reported under the number of the Martin (Rep., Mass.) bill, H. R. 4590, which passed the House December 19, 1945, and would have authorized sales of Treasury silver at 71.11 cents.

As the situation stands the Senate Appropriations Subcommittee is now in position to drop the House "rider" carrying the 71.11 price, and if and when the Senate passes the Murdock bill it will go to conference with the Martin bill, with conferees appointed from the Banking and Currency Committees of the House and Senate.

The Murdock bill also repeals the transfer tax of 50 per cent on profits derived from private transactions in silver. It eliminates provisions of the

(Continued on page 72)

Personals

The St. Joseph Lead Co. has announced that **Andrew Fletcher**, formerly vice president, has been named executive vice president; **Francis Cameron**, formerly assistant to Mr. Fletcher, vice president; **George I. Brigden**, formerly secretary and comptroller, treasurer; **Robert Bennett**, formerly assistant treasurer and assistant secretary, secretary.

A. L. Anderson has been appointed assistant fuel service engineer for the Chesapeake and Ohio Railway Company at their Detroit office, succeeding **A. D. Muldoon.**

Charles H. Fuchsman has joined the staff of the research division of International Minerals and Chemical Corp. at Carlsbad, N. Mex. Fuchsman was formerly associated with the experiment station of the U. S. Bureau of Mines at Boulder City.

Charles F. Kottcamp has joined the staff of the Locomotive Development Committee of Bituminous Coal Research, Incorporated, it was announced by **R. B. White**, chairman of the committee and president of the Baltimore and Ohio Railroad. Mr. Kottcamp will assist **John I. Yellott**, director of research for the committee, in the development of the coal-burning gas turbine.

C. T. Harvey is now in charge of electrical work for the Copper Canyon gold dredging operations of Natomas Company near Battle Mountain, Nev. Harvey was former superintendent of the Adelade Crown mine at Golconda, Nev.

Matthew R. Rosse has been appointed export manager for the Colorado Fuel and Iron Corporation, including all divisions and sub-divisions. Mr. Rosse was formerly export manager of Wickwire Spencer Steel, a division of the Colorado Fuel and Iron Corporation since 1943. His headquarters will continue to be located at 500 Fifth Avenue, New York 18, N. Y.

Elmer Mayor and **Arthur F. Lee** have been promoted to superintendent in charge of all production and engineer in chief for all of the Binkley Coal Co. interests in Arkansas, Illinois, Indiana and Missouri. Mayor was formerly assistant general superintendent and Lee mining engineer of the firm.

E. H. Snyder, president of Combined Metals Reduction Co., Salt Lake City, has been awarded the honorary degree of Doctor of Mining by the president and board of control of the Michigan College of Mining and Metallurgy from which institution he obtained his B.S. and E.M. degrees in 1911.

Francis S. Gibson, formerly district sales manager of the Pittsburgh Coal Company in New York is now connected with the sales organization of Consolidation Coal Company with headquarters in the R. C. A. Building, New York City.

C. C. **Cushwa** has been appointed superintendent of the Ancho Erie Mine at Grass Valley, Calif. Cushwa was formerly manager of the Spring Hill Mine also at Grass Valley.

Robert L. Llewellyn has become preparation engineer for the Valley Camp Coal Co. located at Elm Grove, W. Va. Mr. Llewellyn was formerly a designing engineer for Island Creek Coal Co., at Holden, W. Va.

Stanley D. Means, head of the Industrial Sales Division of R. G. LeTourneau, Inc., has been named domestic sales manager for the company at Peoria, Ill.

The Cripple Creek assay office of **P. B. Van Dolah** has been purchased by Adolph Poston of Denver. It will be operated as the Poston Assaying Co. This assay office was originally owned by Joseph B. Page, who operated it through the great boom days of the camp until his death in 1938.

John Fielding, Jr., has taken the position of co-ordinator of purchases for the Hanna Coal Co., a subsidiary of the M. A. Hanna Company, with offices in Cleveland, Ohio. **Morris A. Bradley**, who was recently discharged from the United States Army, will be assistant director of purchases for the same company.

Walter W. Bradley, state mineralogist and chief of the California Division of Mines, Ferry Bldg., San Francisco, is planning to retire on July 1 of this year. Bradley joined the bureau in 1912 and has been associated with state service ever since, in California.

L. Newton Thomas, vice president of the Carbon Fuel Company for a number of years, has been named president to succeed C. A. Cabell, deceased. Mr. Thomas started work with this company as a rodman in the engineering department in 1924. He handled various operating jobs, such as assistant foreman, foreman and general superintendent, spending in all nine years in the operating department. The next nine years were spent chiefly in the sales department and since that time Mr. Thomas has acted in an executive capacity. The home office of the Carbon Fuel Company is at Charleston, W. Va.

C. J. Young is now on the operating staff of the Resurrection Mining Company at Leadville, Colo. Young was formerly superintendent of operations for the Wilfley Leasing Company at Kokomo, Colo.

John J. Sheey has been appointed as president and general manager of Bradley Mahoney Coal Corporation, a subsidiary of the Lehigh Navigation Coal Company.

Dr. Charles J. Potter, former Deputy Solid Fuels Administrator, was recently decorated with the Medal of Merit for "exceptionally meritorious conduct in the performance of outstanding services to the United States." The decoration was pinned on Dr. Potter by the Secretary of the Interior **J. A. Krug** in his office in the Department of the Interior on Thursday, May 9.

M. E. Harris will be in charge of all underground work at the Uncle Sam mine near Redding, Calif., an operation of the High Divide Mining Company. Harris was former mine foreman for the Mountain Copper Co., Ltd., at the Richards mine.

On June 21 **R. L. Ireland, Jr.**, president of the Hanna Coal Company, will be the speaker at the annual meeting of the Mineral Producers Association of Pennsylvania, to be held at the William Penn Hotel in Pittsburgh, Pa.

Robert Reynolds has resigned from the Illinois Geological Survey and has accepted the appointment as geologist and engineer for Inland Lead and Zinc Company at Livingston, Wis.

J. M. Tully has been elected president of the Crystal Block Coal & Coke Co. of Huntington, W. Va. Mr. Tully will succeed the late Luther E. Woods.

Charles F. Herbert, after service with the Seabees in the Pacific, has returned to civilian life. He expects to be in Alaska where, before the war, he was manager of the Wade Creek Dredging Co. and served as a director of the Alaska Miners' Association as well as a member of the territorial legislature.

H. B. Burwell has recently been appointed state geologist of Tennessee and director of the Division of Geology at Nashville.

Six naval veterans and a former member of the War Production Board have recently returned to their prewar jobs in the Industrial Division of The Timken Roller Bearing Company, Canton, Ohio.

The veterans and their present positions are as follows: **R. G. Harmon**, field engineering, Chicago; **D. G. Gibson**, field engineering, Cincinnati; **S. T. Salvage**, assistant district manager, Industrial Division, Cleveland; **R. L. Williams**, field engineer, Cleveland; **F. J. Hartshorne**, field engineer, Milwaukee; and **L. M. Meyer**, field engineer, Pittsburgh.

L. H. Gegenheimer, the former WPB member, is now district manager of the Industrial Division in Boston.

Dr. William A. Mudge, assistant director of the Technical Service of International Nickel Company's Development and Research Division, at New York, has been elected chairman of the New York chapter of the American Society for Metals, to serve during the coming year, 1946-47. During the past year. Dr. Mudge has been chairman of the Technical Program Committee.

James A. McQuail will open a branch office for the Williamson Supply Company at Pineville, W. Va. This office will service Pineville, Mullens and the vicinity of Beckley, as well as Northfork.

A. P. Hall has been elected vice president of American Chain & Cable Company, Inc. Before joining the company in 1944, he had been in the steel industry for 22 years and is well known in the metal and allied fields. He will continue his present duties as general manager of sales with headquarters at 230 Park Avenue, New York City.

Matt Murphy, state mine inspector, has announced that **S. R. DuBrava** has been appointed deputy state mine inspector of Nevada with headquarters at Las Vegas.

At the annual meeting of Idaho Maryland Mines, held in San Francisco, the following were elected to its board of directors: President, **E. L. Oliver**; vice presidents, **Errol MacBoyle** and **Fred E. McNear**; executive vice president and general manager, **Neil O'Donnell**; secretary-treasurer, **E. B. Mannington**; additional directors, **Mrs. Glen MacBoyle** and **C. S. Borden**.

Earl C. Robertson, vice president of the Pittsburgh Coal Co., has announced the retirement of **Walter L. Sheppard**, who for the last 25 years has been general sales manager and assistant to the vice president. Sheppard has been with the company for 45 years. **John W. Eagan**, sales manager for the past 35 years in the company's Youngstown office, is retiring because of age and ill health.

J. F. Siegfried, mine superintendent of Lava Cap Gold Mining Corporation at Nevada City, Calif., was recently named chairman of the mining committee of the Chamber of Commerce of Nevada City.

Quentin D. Singewald, who was formerly on the metal staff of F. E. A., has resigned his position as Professor of Geology at the University of Rochester and will remain permanently with the U. S. Geological Survey.

— *Obituaries* —

C. A. Cabell, president of the Carbon Fuel Company, Charleston, W. Va., died early in May. Mr. Cabell was 76 years of age and had a long and prominent record in the coal mining industry. He was first employed with the Mt. Carbon Coal Company in Fayette County, W. Va., and in 1905 he, along with others, organized the Carbon Fuel Company, which was a sales agency for the Carbon Coal Company, the Republic Coal Company, and the West Virginia Collieries Company. In 1917 all of these companies were merged in the Carbon Fuel Company, as it is known today. Mr. Cabell was vice president at that time and became president in 1925 and remained in this position until the time of his death. He was also former president of the Kanawha Coal Operators Association and for many years gave much of his time to civic activities.

George A. Collins, well known Denver mining engineer, was killed in an automobile accident at Ouray, Colo., on May 2. Collins was a prominent figure in Colorado mining circles and held property at Ouray, Gilpen, Clear Creek, San Miguel and other counties throughout the state. He was exceptionally well versed in mining matters and had wide contacts in technical and scientific societies and in fields other than mining. Collins was also one of the original founders of the American Mining Congress when it was first organized in Denver.

George F. Moser, former general superintendent of the Tom Reed mine at Johnnie, Ariz., died at the age of 68 at Kingman in April.

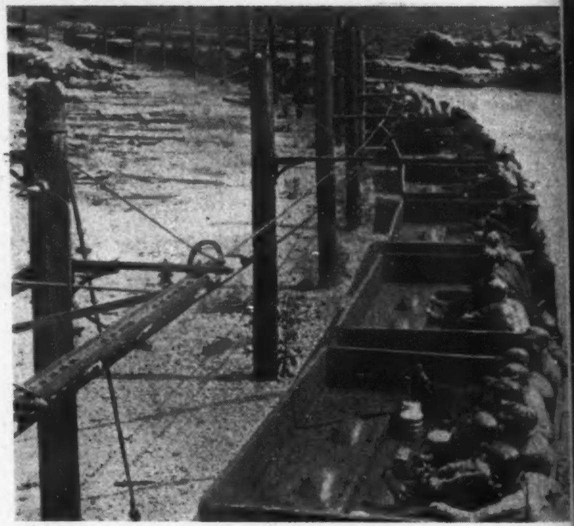
Denman Dorr, prominent California mine operator, died of a heart attack in Auburn, Calif., during this last month. Mr. Dorr was the owner of the Lebanon drift mine in Iowa Hill, and until recently was the superintendent of the Brush Creek Mine at Goodyears Bar, Sierra County, having installed their new mill and placed it in operation for Alfred L. Merritt of Berkeley, Calif.

Arthur H. Lewis, mining engineer for various anthracite coal companies until his retirement in 1945 from the Glen Alden Coal Co., died at the age of 72 at Wilkes-Barre, Pa.

Luther E. Woods, Sr., former West Virginia State senator and president of the Crystal Block Coal & Coke Co., died in Washington in April at the age of 63. For 20 years Mr. Woods had been president of the Operators' Association of the Williamson Field.

NEWS *and* VIEWS

Some coal mines have more than 50 miles of railroad, much of it above the ground. This train of cars is loaded with neophyte miners on their way to a practical lesson in mining the "magic mineral." (See story, page 64)



—Hamilton Wright Photo

Eastern States

Shawmut Mine Enters on New Program

The New Shawmut Mining Company which owns properties at Force, Byrnedale and Hollywood, Pa., has worked out a program to prevent speculative interest in company real estate and to provide engineering service in carrying out local community developments. The new owners of the company have prepared a proposal to sell the company's houses at nominal figures, throwing enough additional acreage into the bargain to provide community buildings and recreation grounds. It is said that an excellent flow of pure water has been tapped for the coal towns by use of fast drilling equipment. The residents of the community are now being given a chance to purchase their own homes and shortly a mass meeting of the miners is scheduled to acquaint residents of the three communities with this new program.

Anthracite Institute's New Headquarters

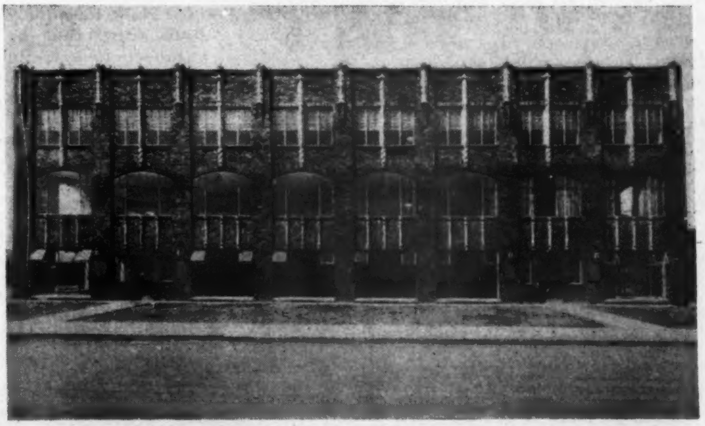
The Martz Building at Melrose Avenue and Old River Road, Wilkes-Barre, Pa., was purchased as a new headquarters and laboratory building for Anthracite Institute, Frank W. Earnest, Jr., president of the Institute announced recently. The building is of steel and concrete construction with a brick veneer facing. Anthracite Institute will use the front section for its main offices, and the back section for laboratory and research facilities.

The actual moving of the headquarters personnel will probably be made between June 15 and July 1. All of the laboratory and research activities now located at Primos, Pa., will be moved more gradually and it is hoped that the transfer can be completed by August 1. Institute offices will be retained at the present New York address, 101 Park Avenue, to handle all matters in connection with marketing, advertising and public relations.

Comments on British Coal Production

If Great Britain continues adoption of the American system of room-pillar mechanized mining in her coal industry, that country may lift its ton-per-man-shift production rate to equal that of modern U. S. bituminous mines with comparable conditions.

That was the belief expressed by H. R. Wheeler, vice president in charge of export sales of the Joy Manufacturing Co., Pittsburgh, in a recent talk before the Engineers So-



Martz Building purchased as new headquarters for Anthracite Institute

H. R. Wheeler

ciety of Western Pennsylvania at the William Penn Hotel, Pittsburgh.

Mr. Wheeler spent three and one-half years in Europe during and after the war studying European mining methods and advising coal producers on means of increasing production by the use of American mechanized mining methods. Most of this tim was spent in Britain, where he visited 72 different mines. He pointed out that during the war British mines were producing two tons of coal per man-shift in seams similar to those in which American miners and equipment were producing 15 to 18 tons. He attributed this low production rate in Britain to long-wall mining and to lack of haulage and materials-handling equipment.

When Mr. Wheeler left England after the war, 125 mines were preparing to adopt American mechanized, room-pillar mining methods and 60 were already operating under the system. Contrary to popular belief, Mr. Wheeler said that not all mines are thin-seam operations in Britain. He said that many seams on the isles were 4 to 6 ft. thick.

Coal—the "Magic Mineral" in New Universal Picture

W. VA.

"Magic Mineral," a short motion picture devoted to coal, has been produced by Universal Pictures and will soon be released to theatres throughout the country.

The actors are all from the district around Bluefield, W. Va., where the film was made.

Coal is not all dust and dirt and fuel, the film shows. Over 150,000 by-products are part of the magic deriving from this homely product. Plastics, tires, nylons, cosmetics and cleaning fluids are among the products shown that are made from coal.

Coal mining used to be associated with squalor, poverty and backbreaking drudgery but the film shows that such is not the case today. A large portion of the picture is devoted to a school in Bluefield, Mercer County, W. Va., where 'teen-age youths learn the A B C's of bituminous mining.

"Magic Mineral" shows that when a 'teen-ager becomes an advanced student at the Mercer County School he is ready to go into an actual coal mine for further instruction. Under the tutelage of an old hand they learn how to conduct themselves below ground. They are taught that coal mining is an acquired science, a fine art—not just sinking a shaft in the ground, and lifting out the coal. The modern pace is too swift for antiquated methods and the embryo miner soon learns that this is so.

The picture also gives some interesting glimpses inside a coal mine—something rarely before pictured. New machinery to bring coal out and some of the precautions taken to prevent accidents are pictured in detail. So is the railroad's part in hauling coal from the mines to tidewater.

Mechanical cutters and mechanical loading devices demonstrate how the average miner's output has risen from approximately five tons a day to a yearly quota of 1,200 tons.

"Magic Mineral" will be available to motion picture theaters throughout the country beginning July 15.

New Mine Safety Law

KY.

The Kentucky Assembly recently passed an improved safety law affecting mines throughout the state. It is expected that the new regulations will result in lowering the number of fatal accidents throughout the coal mines and quarries in Kentucky. The state inspection force is increased from eight to 25 inspectors and improved ventilation is required as well as rockdusting. The budget for the Department of Mines and Minerals was increased from $150,000 to $200,000 for the year.

Consolidation Establishes Kentucky Purchasing Department

Consolidation Coal Company announces the establishment of a Purchasing Department at Jenkins, Ky., beginning June 1, for its Kentucky operations in Letcher, Harlan and Johnson Counties. Clyde Hennen of the company's general purchasing department in Fairmont, W. Va., comes to Jenkins as Purchasing Agent. Mr. Hennen has been connected with Consolidation for many years and is thoroughly experienced and qualified for the work. James L. Witt of Fair-

mont, who, prior to military service from March, 1944, to February, 1946, was timber buyer for Consolidation at Jenkins, is returning to Jenkins as assistant to Mr. Hennen.

Field Courses in Geology

Syracuse University has announced that in conjunction with Cornell College, their annual Geologic Field Camp will be located at Camp Norton in the Wind River district of Wyoming from July 1 to July 28 and August 1 to 28 of this year. Camp Norton is situated on the Wind River about 17 miles northwest of Dubois, Wyo., and 94 miles by road from Lander. Students may register for either or both terms and veterans may receive GI benefits while attending. Those desiring additional information should write to the Department of Geology, Syracuse University, Syracuse 10, N. Y.

New Coal Dock Directory

An up-to-minute survey of the railroad coal-loading facilities and coal docks located on the Great Lakes and St. Lawrence River, has been completed. This exclusive data will be included in the 1946-47 Edition of *MacQuown's Directory of Coal Docks on the Great Lakes*, (132 pages), now being printed and available in the near future.

For many years this "Dock Directory," compiled and copyrighted by W. C. MacQuown, owner of the National Coal Publications, Pittsburgh, Pa., has been supplying valuable data incident to the movement of over 50 million tons of coal annually, over the Great Lakes, in addition to a complete description of the facilities of each dock, coal purchased, officials, etc. Valuable data is included on bulk and self-unloading vessels engaged in the lake trade, movement of coal from the mines to lake and delivery to various ports and timely and authoritative articles of interest.

MacQuown's Directory of Coal Docks on the Great Lakes serves a useful purpose and is the standard reference book on Lake coal. It is supported and used by the outstanding companies and is considered to be one of the most valuable coal directories published.

Coal Recovered After Mine Fire

In the Big Vein coal seam in western Maryland, where fires had formerly raged, it is possible by judicious use of bulldozers in removing overburden above the vein to recover much of the coal over which the fire has passed. The fire had progressed through the wild coal area above the main coal seam and had left good Big Vein coal below the wild coal practically unharmed. In fire areas where coal stripping has been done by mechanical means using power shovels and bulldozers, much new information has been secured as to the actual destruction done by the fire in the Big Vein. In one locality the actual effect of the fire was beneficial in that it appears to have cracked the solid rock above the coal and by means of stripping operations it will be possible to remove large broken rock slabs from the coal seams which are underneath.

Anthratube Developments

Progress in development of the Anthratube was described to a luncheon meeting of the Maryland Coal Association at the Hotel Southern, Baltimore, May 23, by D. A. Zupa, field representative of the Anthracite Institute. Previous models, he explained, were built solely for field testing and more than 65 have been installed in homes, most of the units operating through a full heating season with completely satisfactory performance as to convenience, cleanliness and economy of operation. The latest model has been designed as a unit capable of being manufactured by mass-production methods. It has a cylindrical boiler and weighs 275 lbs., so that two men can carry it into the house as a unit. Installation as well as manufacture, he pointed out, is thus simplified. The coal tube which feeds coal from bin to boiler, and the drive, are easily fastened to the boiler. This unit's output is sufficient to supply heat and domestic hot water requirements of a six or seven-room house.

Central States

Sinking New Shaft

A new shaft is being sunk at the Gray mine near Galena, Ill., by the Tri-State Zinc Company, Inc. The Gray mine is located near the site of the former Black Jack mine which was for many years a well known zinc ore producer.

The workings of the old Ring mine at Jamestown, Ill., has been purchased by Pinckneyville Mine No. 5. A steel tipple has been moved from the Ring mine and erected at the Pinckneyville colliery. Shafts have been retimbered and other safety measures completed.

Zinc Mine Being Dewatered

The Crawhall Zinc Mine at New Diggings, Wis., is being dewatered and will be ready for production soon. As this operation is without a mill, the property will truck its crude ore to the custom flotation plant at Cuba City, Wis. The firm of Meloy & Baker are in charge of the dewatering.

Zinc and Lead Association

The zinc and lead mining region of the Upper Mississippi Valley now have an association of mineral producers known as the Wisconsin-Illinois-Iowa Zinc and Lead Producers Association. The officers are: Prof. E. R. Shorey, Madison, Wis., president; Joseph Van Metre, Platteville, Wis., vice president, and George Sullivan, Platteville, secretary.

Eagle-Picher Operating Piokee and White Leases

The Eagle-Picher Mining and Smelting Company is operating the Piokee and White leases west of Picher. Ore is being shipped by rail to the company's Central mill, and is being pulled at the Piokee shaft where rail facilities are convenient to a large steel derrick and hopper. The M & M Mining Company formerly operated these leases and Eagle-Picher took over with the expiration of the lease. Included in the leases held by M & M were the Slim Jim, Ohimo, LaSalle, Goodwin, Swift and Buffalo in addition to the two properties mentioned above.

Old Bendelari Now Operating

The old Bendelari mine, a half mile northwest of Treece is now being operated by the Little Ben Mining Company. Ore is being drawn from the old Bendelari mill shaft and loaded and trucked to the Eagle-Picher Central mill for treatment.

Operations Expanded on Old Lead and Zinc Properties

The Marcia K. Mining Company, which acquired the old Lawyers Lead and Zinc Company properties southeast of Picher early this year is expanding operations under the direction of Claude Jones. The old Birthday mine has been reopened by the company and the Federal shaft north of the Birthday is being recribbed while the East and North shafts on No. 1 lease have been recently reopened although the latter has been shut down temporarily.

Employes' Hospitalization

An average of more than seven treatments per year by physicians or surgeons is given to the 1,730 coal miners employed by an eastern Ohio coal company, and the 3,720 additional members of their families, for a complete cost ranging from one-half of 1 per cent to 1 per cent of their annual earnings, an analysis of 40,000 case records shows.

The Employes' Medical and Hospital Association to which they belong is sponsored by the company, it is stated, but elected committees of the miners hire the doctors and direct the association business. The company handles the clerical work and checks off the dues for the members.

Members of the association are said to be entitled not only to ordinary doctor's care for minor ailments but hospital and surgical treatment as well as special services such as serums and operations, for a cost per family of \$3 per month or \$1.50 for single employes.

The low incidence of serious sick-

The mine foreman was in here and left this report

ness among the employes' families is stated by the physicians to be due to the fact that patients present themselves for minor complaints early, knowing that the doctor bill is fully paid in advance.

Iron Ore from Steep Rock to Ford Plant

The first shipment of iron ore this season from Steep Rock Iron Mines, Ltd., Rainy River district, northwestern Ontario, left the Lake Superior port of Port Arthur on April 25 bound for the Ford Motor Company at Detroit, officials of the mine report. Carried aboard the steamer *Benson Ford* of the Ford fleet, the shipment amounted to 12,000 tons of Seine River grade ore (a high quality blast furnace product). A second cargo of 9,000 tons of Seine River grade ore was expected to be loaded at Port Arthur about the end of April and carried to Canadian furnaces aboard the steamer *Viscount Bennett.*

The *Benson Ford's* cargo represented the first of a million tons of ore Steep Rock officials estimate will be shipped from the mine this season.

Problem of Continued Iron Ore Production

Butler Brothers of St. Paul, the largest independent mining firm on the Mesabi iron range have proposed a five-point plan designated to preserve the iron ore industry in the state. Although Minnesota has the largest ore-producing area in the entire world, it is faced with eventual exhaustion of high-grade iron ore deposits although there still remains more than a billion tons of lower grade ore which could be profitably mined under favorable conditions. Butler Brothers have indicated that present production of low-grade ore is not profitable and exhaustion of high-grade may drive mining companies into other fields. Butler Brothers recommended that in order to preserve the iron ore industry the following five points are worthy of consideration:

1. Reducing rail freight rates on concentrate ore shipments.
2. Reducing upper lake freight rates.
3. Modifying lower-lake freight rates.
4. Reducing electric power rates.
5. Modifying existing royalty rates.

Meeting of Lake Superior Mining Section of National Safety Council

Plans for the 22nd Annual Mine Safety Conference of the Lake Superior Mining Section of the National Safety Council are complete and the meetings will be held at the Hotel Duluth, Duluth, Minn., on June 20 and 21. The banquet will be held at 6 p. m., on June 20.

A very comprehensive program has been announced covering all the various phases of safety work of interest to operators on the iron range. In addition there is to be a panel discussion on the subject, "Fundamental Causes of Accidents" and practically all the important mine operating companies in the region will be represented by various members of their safety staff in this discussion. There will also be numerous exhibits at the ballroom and it is anticipated that the meeting will be very well attended.

Construction of New Aluminum Plant Near Davenport

Thomas D. Jolly, vice president and chief engineer of the Aluminum Company of America, has announced that the company plans the construction of a large new plant near Davenport, Iowa, for the rolling of aluminum sheet and plate. The construction is scheduled to begin as soon as the project has been approved by the Civilian Production Administration and completion of the plant will take approximately 18 months. Estimates indicate that the plant will cost in excess of $30 million and will have the capacity to produce more than 10 million pounds of sheet and plate per month. Once operations get under way, it is anticipated that approximately 2,000 workmen will be employed at the plant. An outstanding feature of the new plant will be its huge high-speed continuous "hot mills" and "cold mills" capable of rolling sheet up to 120 in. in width. This equipment will produce aluminum sheet and plate in all forms to supply the great post-war demand. Equipment for the new plant has been designed so that it can turn out sheet and plate of aluminum alloy as well as the more common commercial alloys. The plant buildings will enclose 43 acres of floor space under roof, according to Mr. Jolly, and equipment installed will be able to process the largest aluminum ingots manufactured today.

Western States

Development Work at Alma

N. P. Otis of Denver and associates, owners of the Weber Group of claims on Mount Bross above Alma, have leased three of the claims to Rolph Luckenbach of Denver. Development work at Alma is in charge of Ed Moynahan. A power shovel and bulldozer were used in the operation and it is understood a fine body of lead-silver has been exposed by stripping. In 1945 the Forestry Department completed a new road with a grade of less than 5 per cent to the property and this insures cheap truck transportation to the mill.

Dredging Operation in Park County

The South Platte Dredging Co. has reported moving more than 1,800,000 cu. yds. of placer gravel with its big dredge below Fairplay. There is ample ground available for dredging in this region and it is estimated that these properties will have a long life.

Shortage of Miners Still Continues

The Cripple Creek district is still suffering from a shortage of miners and lessees. Merrill E. Shoup, president of Golden Cycle Corporation, estimated that 1,000 miners and lessees are needed to get out known gold in this famous camp. Ores are ready for mining in the unwatered sections of mines benefited by the Carlton tunnel. This tunnel cost the Golden Cycle Corporation around two million dollars but officials say that it will pay for itself many times over. At the famous Cresson mine 42 lessees are working underground and 20 on the surface. The Ajax is another mine that is expected to show increased activities, and there have recently been several excellent discoveries made at this property.

Activities in the Aspen District

Frank and Fred Willoughby are getting excellent results from silver-lead ore from the Midnight mine near Aspen. This ore is being milled at the company's mill and the concentrates are being held due to the smelter shutdown in Leadville. John and Bill Herron are milling the Old Smuggler dump in the same region. Silver, lead and zinc concentrates are being piled up awaiting the opening of the smelter and development work is also being done in the Old Smuggler tunnel. A lease has also been taken on the old Montezuma mine up Pine Creek about 12 miles from Aspen. As soon as snow conditions permit, extensive development work is planned on this property.

Fluorspar Mill Sold

Harry M. Williamson and Son, of Denver, have announced the sale of the Jamestown fluorspar mill to the Mahoning Mining Company, of Rosiclare, Ill. The Mahoning Company plans to produce 800 to 1,000 tons of acid-grade fluorspar per month at the Jamestown mill. The Williamsons will continue their mining operations and will furnish all of the ore required by the new mill operators.

Uranium Ore Located

In the Round Mountain district near Tonopah, Nev., a promising uranium deposit is being developed with tests indicating the presence of torbenite, a copper uranium phosphate. In addition commercial uranium is also reported as present. Jay A. Carpenter, director of the Nevada Bureau of Mines has confirmed the development of this deposit.

Divide District Becoming Important Field

The Divide district, which is located between Goldfield and Tonopah and was the scene of an important mining rush in 1922, is again becoming an important mining district. Profitable ore has been shipped from Tonopah Divide and the adjacent Divide Extension mine by lessees who are operating these properties. Leasers shipped 2,378 tons of silver-gold ore valued $90,393 from the Tonopah Divide in 1945. Ore to smelters in recent months has averaged slightly over $38 per ton and production is expected to be increased materially throughout this year. James H. Smith of Tonopah and associates have started ore shipments from the Divide Extension property to McGill smelting.

Tungsten Report Released

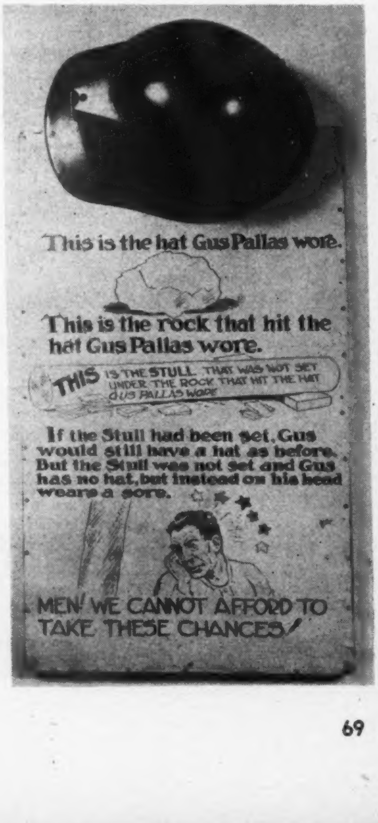
W. E. Wrather, director of the U. S. Geological Survey, has announced the release of a report on tungsten deposits in the Cherry Creek district in White Pine County. These deposits were examined by M. R. Klepper of the Geological Survey in 1943. In advance of publication, the report and accompanying map have been placed in open file at the Geological Survey Library, Federal Works Building, Washington 25, D. C. Other copies are located at the Nevada State Bureau of Mines, Reno, Nev., and at Geological Survey Western Regional Office, 506 Federal Building, Salt Lake City 1, Utah.

Milling Operations Resumed at Silver Palace

Twenty-four hour milling operations have been started at the Silver Palace mine in the Grantsville district, ten miles south of Ione in northern Nye County. The operations are under direction of a group of Hollywood, Calif., men who have expended $150,000 rehabilitating the property.

Revival of Small Operations

Nevada mining papers are filled with items regarding leases and sales of claims, and old-timers believe this is an indication of an important revival of mine activity throughout the state.



Leases have been taken on the old New Pass mine and adjacent property in Lander County west of Austin. The New Pass has been a potential big mine for many years, but it has never been developed, possibly because what development has taken place has not been too encouraging as regards big veins. Probably close to a half million dollars has been taken out in dribbles at New Pass but no one has ever had the money to develop the mine to real depths.

From every part of Nevada are coming reports of the reopening of old mines which in the past were considered good. It is the hope that extensive development of these old properties may bring about a revival of earlier booms. There is much activity in the Goldfield, Tonopah and other areas, but no large crews of men are at work.

Summer Meeting of Mining Association

The summer meeting of the Mining Association of Montana will take place on August 30 and 31 at the Florence Hotel in Missoula. President Porter appointed Art J. Mosby, of Missoula, secretary of the Western Montana Mine Owners & Operators Association, chairman of the General Arrangements Committee. Additional members of the committee are R. J. Fremou, president of the Missoula Chamber of Commerce; Berlin Boyd, secretary-manager of that organization, and Frank Larson, chairman of the Chamber's Convention Committee. Also K. D. Lynn, Butte; W. R. Allen, Wise River; Dr. Francis A. Thomson, president of Montana School of Mines; and E. McLl. Tittmann, manager of the East Helena Smelter, all officers of the Mining Association of Montana. Sidney M. Ward, Clinton, president of the Western Montana Mine Owners & Operators Association; G. T. Vandel, Helena, president of the Last Chance Gulch Mining Association; P. V. Jackson, Norris, president of the Madison County Mining Association, and Frank Madden, Dillon, of the Beaverhead County Mining Association, also have been appointed to act on the General Arrangements Committee. A committee of Missoula residents will be appointed by Mr. Mosby to assist the general state committee. Reservations for rooms at Missoula should be made as soon as possible with Berlin Boyd, manager of the Missoula Chamber of Commerce. A large attendance is expected from the northern mining states.

Dredge Resumes Operation

According to A. Strojan, Jr., of Helena, Mont., manager of Winston Bros. Co., operations have been resumed at its Yuba dredge near Jefferson City, Jefferson County. The dredge is producing gold and at the moment about 20 men are employed in the operation.

Mountain Mines Adds Equipment

The Mountain Mines Co., headed by Charles S. Woodward of Salt Lake City, has contracted for 700 ft. of exploration work at its property to the southeast of Salt Lake City in Big Cottonwood Canyon. Kenneth L. Fields of Midvale will be in charge of the development work which is designed to open two veins in the property. A new mucking machine has been purchased and it is expected that the Silver King vein will be explored by 500 ft. of drifting.

American Gilsonite Co. Opens New Office

American Gilsonite Co., a recent consolidation of the Utah operations of Barber Asphalt Corp., and a division of Standard Oil of California, has established Salt Lake City headquarters in the Utah Oil Building. C. F. Hanson, president, and C. F. Morris, secretary-treasurer, will have their offices here. L. D. Barry, at Bonanza, near Jensen, Utah, remains in charge of the Gilsonite Mining operation.

Asbestos Mills to Open

The Globe Asbestos Company, a subsidiary of Rheem Research Products, Inc., has started milling of asbestos at the Pine Top mill one mile east of Globe. The plant was leased last December and additional equipment was installed by the new owners. L. Mills Beam is in charge of production for the Globe Asbestos concern and R. M. Thomas is president of the company, with offices at Pasadena, Calif.

High Grade Ore from Salty Dog Mine

Development work on the Salty Dog mine, which is being developed by Jack Hauskins and is located on the south side of Lookout Mountain in Mohave County, is showing some exceptionally high assay values. The claim was formerly worked by H. C. Scudder and has had a fine fast production record. It is expected that a road will be constructed to the property in the near future which will allow more accessibility and facility in working the mine.

Troy Copper Company Producing

The Troy Copper Company which was organized last year to operate the Troy mine in the Riverside mining district of Pinal county not far from Dripping Springs, has started production. A 25-ton leaching plant was installed in 1945 and preparations are being made to handle 100 tons of ore a day. Henry R. Scott is president of the Troy Copper Company which has taken over the RFC obligations of the Troy Mining Company.

New Operation Plan for Mackay Copper Mine

IDAHO

The old Empire copper mine which is being operated by the Mackay Exploration Company is making arrangements to drive a 600-ft. raise from the Cossack tunnel level to the 1,000-ft. level, installing a 200-ton mill at the tunnel portal. The company now has a 100-ton flotation plant in operation. W. P. Barton, who was formerly with the Ima tungsten mine is now manager of the Mackay operation.

Big Gold Dredge to Operate New OroGrande

The Mount Vernon Gold Mining Company, near OroGrande, Idaho, has been acquired by Bangasser Brothers, of Seattle and Bellevue, Idaho. Homa F. Smith of Seattle is also in this operating group. A crew of 20 men are operating a dredge which is at work on the property. William B. Short, of OroGrande is engineer and H. B. Timms, of Portland, is dredgemaster.

Coeur d'Alene Reports Net Profits for 1945

Thirty producing mines in the Coeur d'Alene district of Idaho made assessable net profits of $5,029,532 for the year 1945, as compared with $6,679,751 for 1944, according to sworn statements filed with the county assessor for tax purposes. Three other mines reported net losses totaling $217,103. In 1942, 21 mines in the district reported assessable net profits of $8,441,236. The smaller returns for the three succeeding years has been due to controlled ceiling prices for metals in combination with an acute shortage of labor and high prices for labor and material. At present the mines of the district are working at about half capacity for the same reasons. The ore tonnage produced in 1945 was only 1,404,647 tons as compared with 2,243,797 tons in 1942.

Sunshine Declares Second Quarterly Dividend

Sunshine Mining Company has declared its second quarterly dividend of 10 cents per share for 1946, totaling $148,882 and payable July 1 to stock of record June 1. This brings Sunshine's dividends to $297,764 for the current year and the grand total to date to $25,434,063. The company is now removing the concrete dams built on the 3100 level during a recent underground fire, and which have been allowed to remain in place because of a threatened labor strike. The dams would have automatically conveyed the mine water to the 3700 level, thus protecting the company's Jewell shaft, the main lift, in case of work stoppage.

Dredging to be Resumed

ORE.

The Northwest Development Co., which suspended work in 1942 for the duration of the war, is planning to resume dredging operation this season. Company holdings are located near Sumpter, Oreg.,

where two dragline dredges were operating before the war. J. E. Little is president of the company and K. R. Nutting of Salinas, Calif., is vice president.

High Gold Values Reported

L. A. Damon of Marial, Curry County, has driven 200 ft. in his Golden Fraction claim tunnel on the west fork of Mule Creek. The tunnel has developed a vein 7 ft. in width and having a high-grade streak of 6 to 12 in. in width, containing iron and manganese oxides. On the dump 550 tons of ore is reported as assaying $12 to $15 to the ton, excluding the high grade.

New Mill to be Installed

A report from Colville indicates that work will be resumed by the Moonlite Mining Company in the Aladdin district of Stevens County as soon as a compressor is installed. A. E. Wilkerson of Colville is president of the concern. Plans call for the installation of a small milling plant to treat silver, lead and zinc with some copper and gold. Wilkerson will be in charge of the operation, with his son, Mark A. Wilkerson of Colville, as superintendent of production. H. J. McClelland of Seattle is vice president and general manager.

Lead Ore from Death Valley

The Southern Lead Co., which operates the Lead King mines in the northwest corner of Death Valley in the Panamint Mountains, reports that production is now being resumed following release of the property by the U. S. Government. The property happened to be in the danger zone of an aerial gunnery school and consequently was closed throughout the war. A nine-man crew is being employed at the present time and a picking belt is being provided. The operators believe that the present production of two carloads of lead ore per week will be increased as soon as additional trucking equipment can be obtained. George Lippincott of Santa Ana is owner of the Lead King mines.

Dredge Again Operating

The Tuolumne Gold Dredging Corporation is now operating on a three-shift basis at its property south of LaGrange in Stanislaus County. This dredge is equipped with 100 12-cu. ft. buckets and has a capacity of about 250,000 cu. yds. monthly. The general manager for the dredge operation is Estey A. Julian, of San Francisco, and Alan Dunbar is resident superintendent.

California Minerals in 1944

Bulletin No. 132 entitled "California Mineral Production and Directory of Mineral Producers for 1944," has recently been published. This bulletin may be secured through the Division of Mines, Perry Building, San Francisco, Calif., and is a very thorough statistical resumé of California's mineral production for the year 1944. In addition to listing all mineral products, a portion of the bulletin is devoted to mineral production by counties. The booklet is 224 pages in length and contains numerous photographic illustrations as well as tables of metal production.

Mine to Reopen in June

Alaska-Pacific and Consolidated Mining Company, owners and operators of the Independence Mine, will resume operations in June as fast as miners are available, the management announced from its headquarters in Seattle recently. The Independence Mine is the largest and most productive gold quartz property in Alaska since the closing of the Alaska-Juneau. Located in the famous Willow Creek area with mines and operating offices at Wasilla, the company is planning to engage 50 to 60 men in the initial undertaking, the first since closing down its work due to wartime restrictions.

BOOK REVIEW

FLUOROCHEMISTRY, ***by Jack DeMent, Chemical Publishing Company, Inc., Brooklyn 2, N. Y.*** **752** ***pages.*** **$14.50.**

A COMPREHENSIVE scientific treatise on the subject of fluorescent phenomena. Practically every phase of luminescence and fluorescence is discussed and certain basic laws are laid down governing the phenomena. Because of the increased attention being paid to luminescence prospecting, this book will find many readers amongst the mining fraternity. Aside from a wealth of illustrations, the book also has a very interesting table of fluorescent and luminescent minerals—a table that is bound to be of value to mineralogists and those searching for luminescent material by means of ultraviolet prospecting.

Wheels of Government

(*Continued from page* 60)

Silver Purchase Act of 1934 under which the Secretary of the Treasury is authorized to investigate, regulate, or prohibit acquisition, importation, exportation, or transportation of silver, and removes the authority of the President to nationalize silver. Also removed are the price controls on silver of all kinds in the various forms in which it is used preparatory to processing into finished articles.

Atomic Energy

On June 1 the Senate passed and sent to the House the McMahon (Dem., Conn.) atomic energy control bill, S. 1717. Prepared by the Senate Special Committee on Atomic Energy after months of hearings and study, the measure would establish an Atomic Energy Commission of five members working with a General Advisory Committee of nine scientists and technicians. Under the bill the Commission becomes the exclusive owner of all facilities for the production of "fissionable materials." This does not include "source materials" which is defined to include "uranium, thorium, or any other material which is determined by the Commission, with the approval of the President, to be peculiarly essential to the production of fissionable materials; but includes ores only if they contain one or more of the foregoing materials in such concentration as the Commission may by regulation determine from time to time." All source materials on the public domain are reserved to the United States.

During Senate debate on the measure, Senator Murdock of Utah inquired of members of the Special Committee regarding the status of a discovery of any ore on public lands, in which some small amounts of uranium might occur with other metals. To this Senator Millikin of Colorado replied that the uranium content would be the property of the Government but that this would not prevent the locator from developing the other metals.

It is of particular interest to note the statement in the McMahon bill that any provision of the proposed Act or any action of the Commission, to the extent that it conflicts with the provisions of any international agreement made after the date of enactment (and subject to Senate ratification), shall be deemed to be of no further force or effect.

To help increase "Take-Home Savings"

THE Treasury Department has published two new booklets to help you and your employees realize the utmost benefit from your Payroll Savings Plan—benefits proportioned to the extent your employees add to "take home savings" by buying and holding U. S. Savings Bonds.

"Peacetime Payroll Savings Plan" for key executives offers helpful suggestions on the conduct of the Payroll Savings Plan. In addition, it quotes leaders of Industry and Labor and their reasons for supporting the Plan.

"This Time It's For You" is for distribution to employees. It explains graphically how this convenient, easy thrift habit works. It suggest goals to save for and how much to set aside regularly in order to attain their objectives. If you have not received these two booklets, or desire additional quantities, communicate with your State Director of the Treasury Department's Savings Bond Division.

See your Payroll Savings Plan through to maintain your share in America's future. It is sound economics and a powerful force for good today—and tomorrow—as a safeguard for stability and a reserve of future purchasing power—money that is kept within your community.

The Treasury Department acknowledges with appreciation the publication of this message by

MINING CONGRESS JOURNAL

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and Advertising Council

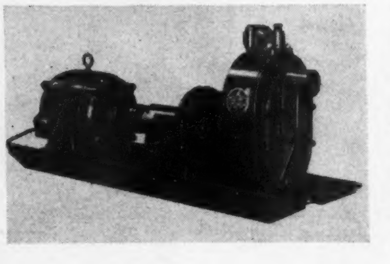
MANUFACTURERS FORUM

Mine Gathering Pump

A new and improved mine gathering pump which is said to cut mine drainage costs substantially is now made by Marlow Pumps, Ridgewood, N. J., manufacturers of the world's largest line of self-priming centrifugal pumps.

The new mine gathering pump embodies all the features of other Marlow self-priming centrifugals. It self-primes without ports, by-passes, or other auxiliary devices. There is no recirculation or wasted motion, and no parts which require adjustment or manipulation. The impeller alone moves the liquid. Its simple efficient design prevents clogging, jamming or other problems. It is completely self-priming on suction lifts as high as 25 ft.

Pump is available in two sizes —2 in., with 2 hp. and 3 hp. motors; 3 in., with 2 hp. and 3 hp. motors. All operate at 1,800 rpm. Pump and motor on sled-type base measure 23⅞ in. high, 12¾ in. wide and 57 in. long. Capacity is 40 to 240 gallons per minute. The pump can be located easily in a small space within a mine —at trackside, in a corner or on a mine



slope. It can be positioned virtually anywhere, because the discharge tee is constructed so it can be used in any horizontal position 90 degrees apart. The discharge hose may lead away from the pump in any direction so the pump may be placed most conveniently without regard to direction of discharge. All pump parts that come in contact with water are constructed of acid-resistant bronze to offset the corrosive effect of mine waters.

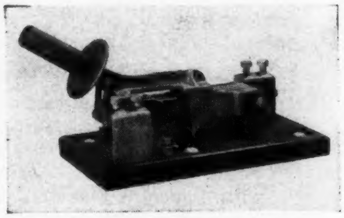
For sweet water mines, an all-iron pump (Type "EL") can be furnished with an iron or bronze impeller.

A bulletin describing this new pump will be mailed by the manufacturer upon request.

Power-Feeder Switch

A multiple blade power-feeder switch, with two coil springs attached to handle for quick circuit break, has just been placed on the market by Mosebach Electric and Supply Co., 1111 Arlington Avenue, Pittsburgh 3, Pa. The quick break feature instantly snuffs the arc and prevents burning of the switch.

Designed for use in mine trolley and feeder circuits where a wide break is desired, the new switch is capable of carrying up to 1600 amperes in the four-blade size, 1200 amperes in the three-blade size, and 800 amperes in the two-blade size. The four-blade switch in closed position is illustrated. Blades and jaws are made from cold rolled copper of ample cross sections for rated capacity.



The new switches are for rib or wall mounting and are of the front connected non-fuse single-pole type. They are equipped with setscrew clamps for gripping cable and no separate terminals are necessary for connecting feeder cables. The clamps will firmly hold all sizes of cable from 500,000 to 1,000,000 C. M. The switch can be furnished in a box if desired.

Metallic Tires for Heavy Duty Service

Located in places throughout the country where rubber-tired vehicles operate under the most hazardous conditions are metallic tires bearing the Goodyear Tire & Rubber Company trademark.

In appearance these tires closely resemble those of the conventional type. Yet fine metal wire of high tensile strength is firmly bonded with rubber to provide the foundation of this unusual tire. It is designed for heavy-duty service in such fields as logging and strip mining of coal and ore.

Goodyear's method of constructing the wire tire consists of integrating a layer of thin, strong tensile wire between two laminations of rubber. The first ply of rubber is placed on a building wheel, rubber cement is added to insure adhesion of the wire, which is then put on by an automatic device. Cement is then spread on the wire before a second lamination of rubber is added. Method of building from this point is much the same as that of constructing a cotton or rayon tire.

Although not yet in volume production, Goodyear technicians are following with interest new developments that come out of the wire tire's day-by-day performance. Production schedules are under way that promise ultimate release of the tire for general use.

Westinghouse Announces 5 KVA Portable Brazer

For making lap joints in copper strap, attaching terminals to cable, brazing coil ends and general copper smithing work, a new portable 5 kva. brazer weighing only 30 lbs. is announced by the Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

The new brazer, which requires connection to a 220-volt source, consists of a transformer, voltage selectors, controls, and carbon-tipped tongs. Alternating current from an adjustable voltage transformer passes through the tongs and parts to be brazed, raising the temperature to a point at which the brazing alloy melts. The brazing alloy may be applied in the form of a rod or in ribbon form. Three outlets are provided on the control panel for 8, 6 or 4 volts. Voltages are easily and quickly adjusted by inserting bayonet plugs attached to the brazing leads into plainly marked receptacles. A foot switch with pilot cable serves as the primary control switch.

For use with air-cooled tongs, the new brazer is supplied with a handle for carrying. The 30-lb. unit is cooled by natural air circulation.

Complete information will be furnished upon request to the company.

Caterpillar Expands

The largest expansion program in the history of Caterpillar Tractor Co., one that will enlarge the floor area of the Peoria, Ill., plant by nearly 50 per cent is revealed in an announcement by L. B. Neumiller, president of the company.

Scheduled to be carried out progressively so that production can be increased as soon as possible, the expansion is expected to permit manufacture of more tractors by September of this year. Other benefits will be felt increasingly in succeeding months as little or no interruption to production and no interference with the introduction of new models is anticipated.

Completion of the huge undertaking, which will add approximately 180,000,000 square feet of floor space —about 41 acres—to the Peoria plant, is expected for the summer of 1948.

A new factory, requiring 925,000 sq. ft. under roof for the manufacture of Diesel engines is the major project in the "Caterpillar" program.

Dust Collector with High Portability Employs Two-stage Air Cleaning

Exceptional portability for a completely self-contained dust collector, which requires no installation other than the mere placing of the unit in position on the bench and plugging into the lighting circuit, is a feature of the newest addition to its line of industrial dust collectors by Aget-Detroit Company, 602 First National Building, Ann Arbor, Mich.

Though designed primarily for precision bench-type dry grinding, the dust collector has, due to its design, a wider range of uses. Buffing, polishing, and similar work which produces great amounts of long stringy material, lint, bristles, etc., can be easily handled, it is claimed, because the unit is equipped with a self-clearing paddle wheel fan. A removable pan in the grinding wheel hood allows sludge from wet grinding operations to be emptied separately, thus keeping it out of the collector. A baffle plate in the hood prevents small work from being drawn by the air suction into the fan and at the same time spreads the effective area of the suction.

Reclaiming precious metal dust is simply a matter of removing the collected dust from the unit and by melting the finer particles out of a spun glass filter. Filter material is easily replaceable, and is available at low cost, it is said. Maintenance is chiefly a matter of turning the hand crank which shakes the finer particles out of the filter material.

Announcements

B. P. Spann, well known in publication circles as advertising manager of the **Gardner-Denver Company,** Quincy, Ill., has returned to the company after service of more than 38 months in the Navy.

Mr. Spann, who has been with the Gardner-Denver Company since 1934, was granted a leave of absence in November, '42, to enter the Navy. Stationed at the Aviation Supply Office in Philadelphia, he was Officer in Charge of Maintenance and Overhaul Spare Parts for all Navy transport aircraft. When discharged, Mr. Spann had the rank of Lieutenant Commander, having risen from the rank of Lieutenant (j.g.).

* * *

William C. Carter, president, **Link-Belt Company,** announces that at a special meeting of the Board of Directors held in Chicago May 7, 1946, arrangements were made for George P. Torrence to again become associated with Link-Belt Company.

Mr. Torrence will rejoin the Link-Belt organization on July 1, 1946, as Executive Vice President. He will become president of Link-Belt Company November 1, 1946, at which time Mr. Carter retires as president, in accordance with the company's retirement plan.

The Board created an Executive Committee consisting of directors Howard Coonley, Russell Livermore and W. C. Carter with Mr. Carter as chairman.

Mr. Torrence was with Link-Belt Company from 1911 to 1936, when he resigned as president. He has been in Cleveland since 1936 as vice president and general manager of The Rayon Machinery Corporation, a subsidiary of the Industrial Rayon Corporation, and as president of the Cleveland Pneumatic Tool Company.

* * *

Robins Conveyors, Inc., manufacturers of materials handling machinery, announce the retirement of C. C. Brooks, who was Western manager of the Hoisting Machinery Division, with headquarters in the Chicago office of the company. Mr. Brooks joined Robins in February, 1934.

* * *

T. J. Harris recently rejoined the **Ohio Brass Company, Mansfield, Ohio,** following his separation from the Navy. He was discharged as an Aviation Electronics Technician's Mate

2-c after two years in service. Mr. Harris has returned to Kentucky to take over the Kentucky, Tennessee and Virginia mining territory, which district he handled from 1941 until 1944, when he left for service.

CATALOGS AND BULLETINS

CONVEYOR BELTS. *The B. F. Goodrich Company,* Akron, Ohio. Catalog Section 2220 is a guide in four pages to the selection of various types of conveyor belting. The guide gives illustrated cross-sections of the belts and data on weight, friction, and cover tensile strength. The materials for which the various types of belting are designed, are also listed.

DIRECTORY. *National Coal Publications,* 1201 Berger Building, Pittsburgh 19, Pa. The eighth (1946 Edition) of "Macquown's Directory and Handbook of Anthracite," is now available. Data is given on anthracite production and selling companies and a map is furnished of the anthracite fields.

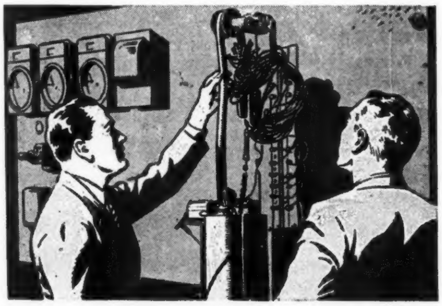
SHOVELS. *Link Belt Speeder Corporation,* 307 N. Michigan Avenue, Chicago 9, Ill. Catalog No. 2098 is a 24-page booklet covering their line of 1½ to 2 cu. yd. capacity shovels, cranes and draglines. The catalog contains numerous photographs of equipment in use and a convenient table of ranges and capacities of the "Series 300" Machines.

TRUCKS. *The Euclid Road Machinery Co.,* Cleveland 17, Ohio. Catalog form No. 300 lists many machinery illustrations, open pit mining, truck haulage. The catalog shows typical application of rear dump and bottom dump for use in either coal or other excavations. It has numerous metal color cuts as well as photographs, is 32 pages in length and shows trucks in use in the iron ranges, lead mining, limestone quarries, coal mining, etc.

WIRE AND CABLE. *Anaconda Wire and Cable Company,* 25 *Broadway, New York.* Anaconda Publication No. C-46 is a 60-page booklet giving a thorough discussion and description of copper cable for mine use. The bulletin contains numerous tables and diagrams and considerable valuable information on the use of copper cable underground.

INDEX TO ADVERTISERS

It doesn't take much "tortional twist" to make a cat meow "Uncle." But that's just a gentle caress compared to what our laboratory boys do in testing U.S. Royal Mining Machine and Locomotive Cables. Add to the twisting indignity, punishment by impact, compression, heat, cold and immersion in water, and you'll understand what is expected of U.S. Royal wires and cables.



THIS IS THE TWIST TEST

A 42-inch length of cord, sizes 18 to 10 Awg., is twisted through 180° in each direction while supporting a 50-pound weight and while being pulled back and forth over a 3" diameter pulley (top pulley in illustration) at the rate of 15 cycles per minute. Electrical circuit in the cable indicates failure due to a short between conductors or a broken conductor.

Two-Conductor Royal Cords and Cables stand a minimum of 15,000 cycles of twisting in accordance with the above test.

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